UNITED STATES ARMY

FEBRUARY 1974

AVIATION DIGEST

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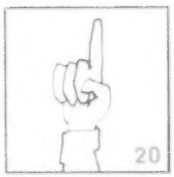
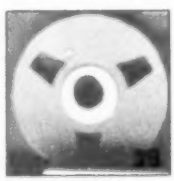
FEBRUARY 1974 VOLUME 20 NUMBER 2

Views From Readers ... 1
Ist Combat Aerial TOW Team: Helicopter vs Armor, CPT S. L. Christine ... 2
Wow! Beautiful! CPT George W. Lang Jr. ... 6
A Penny Saved, CW2 Robert Browning ... 8
Training To Ditch ... 12
The Replacement, CW2 David R. Katz ... 14
Human Behavioral Conference, MAJ Donald I. Saathoff ... 16
Instrument Corner ... 18
Students Ask The Darndest Questions, CPT James L. Busbee ... 20
WAC Mechanics ... 23
Silver Eagles, CPT Gerald P. Kokenes ... 24
What Would You Have Done? CPT Anthony Geishauser ... 27
The Military Occupational Data Bank ... 28
CPT Allen R. Tyre and Perry L. Gary, DAC
IMC ... 30
178 Seconds ... 32
Out Of Gas ... 34
Command Supervision And Maintenance ... 36
Write To Right ... 39
What If JP-4 Is Not Available? ... 40
Operation Longhaul ... 41
Pearl ... 46





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Richard K. Tierney

ABOUT THE COVER

The DIGEST salutes the Silver Eagles after their splendid first year and wishes them continued success in the future. See story on page 24

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The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of the Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

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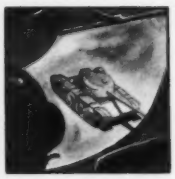

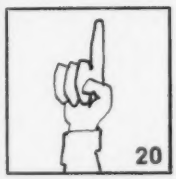

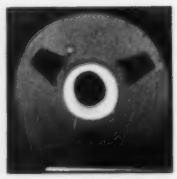

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VIEWS FROM READERS

Sir:

Thank you for the interesting article on firemaking ("Mad Dogs And The DIGEST Staff," October 73 DIGEST). I would like to suggest that in a genuine survival situation you will need more reliable methods of firemaking however. Ideally, the method should work day or night, in all weather, under adverse conditions of rain and cold.

My own solution, although a nonsmoker, is to carry disposable butane lighters (T.M. "Cricket" and others) in my personal gear and survival kit while flying or hunting. Consider the advantages of this method:

1. Lightweight, small bulk.
2. Sealed fuel supply.
3. Long life.
4. Moisture-resistant (if kept in a plastic baggie, waterproof).
5. Works anytime, anywhere—even in high winds and when fingers are numb with cold.
6. Permits an adjustable flame to be directed at any object for any length of time—this will start a fire from even wet wood.
7. Low cost.

A flashlight may be a convenience, but a dependable source of fire is a *necessity* in a survival situation.

MAJ Auton S. Nesse
47th Avn Bn, Medical Section
St. Paul, MN 55107
St. Paul Downtown Airport

Sir:

The October issue of your magazine carried two related articles concerning controller stress. Perhaps a few of the Army's pilots who read the article have concluded that stress applies only to civilian controllers at airports such as O'Hare, or Los Angeles, or in air route traffic control centers. Very few know the pressure that Army controllers face daily.

Face it we do!

To a controller stress and the headaches, upset stomachs and mental fatigue that ride with it is like a broken nose to a boxer . . . it is part of the job.

Army controllers face the same pres-

Continued on page 19

CAPTAIN GEORGE W. LANG JR. receives the Federal Aviation Administration's Certificate of Appreciation from William E. Morgan, Chief, Air Traffic Division, FAA's Southwest Region. The story "Wow! Beautiful!" on page 6 describes the events and role Captain Lang played in preventing an aircraft accident and saving the pilot's life.

The letter of appreciation that accompanied the certificate reads in part . . . "Please accept our appreciation for the outstanding assistance rendered by you to N115, a Piper Cherokee 180, east of El Paso, Texas. The pilot of N115 was on a VFR flight plan from San Antonio, Texas, to El Paso, Texas, and had insufficient fuel to land at El Paso International Airport. With your calm execution of duties and assistance, the pilot was able to accomplish a safe landing on Highway 180, 9 miles east of the El Paso VORTAC, without damage to the aircraft or injury to himself. Your actions in this incident indicate a high degree of skill and I am certain the pilot joins us in thanking you for your assistance."

Aerial TOW missiles accounted for 24 tanks during their deployment to the Republic of Vietnam

1st Combat Aerial TOW Team:

Helicopter vs Armor

Captain S. L. Christine — 155th Aviation Company (Attack Helicopter)

THE AERIAL TOW—Tube launched, Optically tracked, Wire guided—missile proved to be effective in combat in the Republic of Vietnam. In fact, the lessons learned reveal that the TOW will figure significantly in the development of Army aviation tactics.

The 1st Combat Aerial TOW Team was formed and deployed on 22 April 1972 to Vietnam, returning to the United States on 22 June 1972; this was the first time in the history of aviation that a helicopter TOW system was employed in combat against a heavily armed enemy force.

TOW had its origin in 1967 when a one-of-a-kind aerial delivery kit generated enough interest in military circles to initiate the production of four more kits for the TOW antitank missile system. Then in the spring of 1971 the Heeresfliegerwaffenschule (the German Army Aviation School) requested representatives from the U.S. Army Missile Command, Bell Helicopter Company and Hughes Aircraft Company to assist in an endeavor to test the aerial delivery of the TOW [see "Germany Tests Airborne TOW," March 1972 AVIATION DIGEST]. The high degree of success in the German evaluations contributed to the Army's continued interest and subsequent engineering tests throughout the world to affirm the validity of this important yet unproven device.

In 1971 the 155th Aviation Company (Attack Helicopter) was employed as the aviation asset to the Combat Developments Experimentation Command (CDEC) to evaluate the effectiveness of the attack helicopter (AH) team as part of a combined arms team defending against an armor heavy threat force in Experiment 43.6 AH-Daylight Defense. This major experiment was a consequence of three previous AH evaluations conducted in 1970 at Yuma Proving Grounds, Yuma, AZ, and Hunter Liggett Military Reservation, Jolon, CA, to determine the capabilities of the AH in European mid-intensity warfare during the 1975 to 1980 timeframe. The data collected would be used to support DOD level decisions on the future of the Army's AH program. The experiments viewed the capabilities of various radar, infrared, visual and aural systems, air-to-air acquisition evaluations and different mixes of scout and AH teams pitted against armor threat forces.

Experiment 43.6 dealt with the development of doctrine, tactics and techniques of AH employment and a determination of loss exchange ratios measured by a complex computerized instrumentation system designed for realtime casualty assessment. Especially examined were helicopter optical, video and infrared (IR) acquisition systems, including elected subsystems of the AH-56 Cheyenne and the AH-1G HueyCobra multiweapons fire control system. The primary four phases of the experiment took place between May 1971 and June 1972 and closely interrelated with developments and evaluations concurrently run at the Armor School, Ft. Knox, KY; the MASSTER Program, Ft. Hood, TX; the Aviation School, Ft. Rucker, AL; and the Ansbach Trials, Germany. Phase I was considered the training and learning phase, requiring the aviators to absorb new techniques of AH employment including habitual nap-of-the-earth flight, taking advantage of natural cover and concealment, sneak and peek tactics, and engagement at maximum ranges to reduce the effectiveness of the air defense threat. The complexity of this task was increased since all previous aviator training and experience had been oriented to a Vietnam low-intensity warfare environment where the aviator enjoyed air superiority. Two-sided freeplay battle exercises brought

the aviators to peak proficiency to conduct Phase II.

This portion of 43.6 represented the first time that a two-sided, free-play, realtime casualty assessment in any field experiment had been attempted with success. A two AH/one scout mix was incorporated with friendly ground forces pitted against an armor threat force representing a medium tank company reinforced with air defense weapons. At the conclusion of this phase the AH team clearly demonstrated that it could consistently engage stationary and moving armor and air defense weapons targets at long standoff ranges with favorable hit-kill exchange ratios, illustrating the importance of the AH role in the combined arms team.

Phase III consisted of four side experiments and was the high-light of these endeavors, culminating with the success of the 1st Combat Aerial TOW Team in the Republic of Vietnam.

The primary side experiment was designed to gain data concerning new helicopter acquisition devices, among these the XM26 TOW system, in response to a requirement to gain information with which to answer objectives initiated by the Office of the Secretary of Defense. The experiment proved that the AH consistently gained detection and first-fire advantage over an enemy air defense threat when equipped with a stabilized and magnified optical sighting system. Lessons learned in hundreds of flight hours in nap-of-the-earth and out of ground effect hovering operations throughout this field experimentation were then combat tested in an extension of Experiment 43.6.

Simultaneously a joint Canadian, German and American evaluation of capabilities of all AH in the actual environment was taking place at Katterbach, West Germany. The primary objective of this joint effort was to determine if an attack helicopter equipped with an antitank weapons system capable of engaging at 3,000 meters would be effective in the European theater. Evaluation scenarios included three tactical situations surrounding an aggressor attack: delay, defense and breakthrough operations employing helicopter mixes of two AHs and no scouts, and two scouts and one AH. All player vehicles were equipped with complete instrumentation packets for data collection and simulation of realtime battle assessment. The AH-1G attack helicopters employed a TOW missile simulator system made up of a Zeiss Peri-R-12 stabilized panoramic sight (as used in the German Leopard II tank), an Eichweber laser projector and control boxes. Tactics specified for use paralleled those used by CDEC's Experiment 43.6 except that no trial area was ever used twice and that all sites incorporated rolling terrain, heavily forested areas and villages for concealment. Invaluable data including a kill ratio of in excess of 16 tanks to one helicopter substantiated that the AH could survive against and, in fact, decisively engage an armor threat.

Crews were selected from Combat Developments Experimentation Command, the 155th Aviation Company and augmented by individuals from the 7/1st Cav, Ft. Knox, KY.

Training and field execution using only the sighting system took place between May 1971 and March 1972 when about 300 detections and acquisitions were performed at Hunter Liggett during Phase II, Experiment 43.6. The culmination of this use of the XM26 TOW visual sighting system was conducted in March and April 1972 at Ft. Riley, KS, and Ft. Lewis, WA. Here the capability of the system was evaluated in a different terrain environment than that of the mountains of Hunter Liggett Military Reservation.

On 15 April, while conducting intervisibility experiments at Ft. Lewis, the team was alerted on a volunteer basis for 60 days TDY by the Department of the Army. It was to move to Vietnam with its aircraft and equipment to augment the fire support capability of U. S. and RVN forces, combating the North Vietnamese spring offensive. All teammembers volunteered to evaluate the weapons system, even though it was untried and unproven in combat.

The aviator crewmembers on the other hand did have expertise. Only one of the six had not participated in CDEC experiments. This individual was from the U. S. Army Aviation Systems Command (AVSCOM). All six of the aviators had previous tours in Vietnam. Each of the three pilots had gunship experience and two of the copilot/gunners had previous experience as scout pilots. The combined flying time of the six was approximately 10,000 hours and they had among them a total of 185 Air Medals and 6 DFCs.

The team departed the U. S. on 22 April by U. S. Air Force C-141 and arrived in Vietnam on 24 April. The reassembly of aircraft and weapons systems was accomplished at H-3, Ton Son Nhut. Then the team moved to Sanford AAF (Long Binh) on 27 April to prepare for operational commitment. At Long Binh they were attached to the 1st Aviation Brigade. During that short time period each of the three copilot/gunners was given additional training on the XM70 trainer. This training device scores gunner tracking ability. At the same time the three pilot/aircraft commanders developed high gross weight and high density altitude pilot proficiency as pertained to the limitations of the UH-1B aircraft.

Upon completion of this training

the team moved to Pleiku under the operational control of the 17th Combat Aviation Group. Once set up operationally, the team continued with further training—a live firing destruction mission. It included first firings of missiles by each gunner at selected targets in designated areas on 1 May. The training was considered a must because no test firings of the two systems had been conducted incountry and none of the crewmembers had ever fired the TOW missile. After each gunner fired a limited number of practice shots the team was considered fully operational for daylight commitment.

Due to the severity of the North Vietnamese offensive at that time, TOW night capability was investigated. Results of this investigation indicated a limited night capability for the moment. The gunner's sight has both 1½ and 13 power magnification.

Further investigation and improvements of techniques for night operation are currently being conducted.

Team organization for tactical employment consisted of the two UH-1B model TOW mission aircraft (one of which had been used in the first Germany tests), a UH-1H command and control aircraft and two HueyCobra gunships. A third complete TOW system was onhand as a replacement but was not needed. The team at the time of deployment consisted of:

- 6 aviator crewmembers (3 pilots and 3 copilot/gunners)
- 2 crewchiefs
- 1 operations sergeant
- 1 Missile Command (MICOM) representative
- 1 Bell Helicopter Company representative
- 4 Hughes Aircraft Company representatives

Operations were conducted throughout the period of employment from Camp Holloway, Pleiku. The crews were committed on 2 May in an engagement in the Kontum area and remained in combat until 12 June. Kontum was utilized as a staging area until the tactical situation prevented safe operation.

After being briefed initially (and daily thereafter) on the enemy situation, the decision was made and the crews instructed to engage all targets where possible at maximum standoff ranges of 3,000 meters and at sufficient altitude, usually 3,000 feet, to preclude vulnerability to accurate small arms fire. This proved to be the best flight profile under prevailing combat conditions in the team's area of operations.

When scrambled by the 17th Group Operations Center the aircraft usually received their operational briefing while enroute to the target area from the UH-1H command and control aircraft. Additional mission information was passed through the C&C aircraft or directly by the onstation "air boss."

Through experience in previous field experimentation at CDEC, even though the enemy sometimes uniquely camouflaged its resources,

CW2s Danny Rowe and Douglas Hixon accounted for 21 of the 24 tank kills

the crews were able to identify and engage targets expeditiously. Throughout its employment in Vietnam, although primarily developed as an antiarmor weapon, the aerial TOW system proved its value against a full spectrum of hard point targets as is shown in the summary of results.

Two men accounted for 21 of the 24 tanks destroyed. CW2 Danny G. Rowe of the 7/1st Cav had 12 to his credit—a "double tank ace"—while CW2 Douglas R. Hixson of the 155th Aviation Company (AM) had nine tanks. These men found the optimum air speed for accuracy to be 50 to 80 knots.

The first enemy tanks destroyed by the TOW were three PT-76s (Russian made) found in the vicinity of Ben Hiet on 2 May. On 14 May the first two T-54s (also Russian made) were likewise knocked out.

The highlight of the tour was during the battle of Kontum on 26 May when 10 tanks were destroyed in 2½ hours through consistent hits by the TOW crews. The following day the last two known enemy tanks in the area (T-54s again) were demolished.

With no remaining enemy armor to battle, the TOW crews began training again. This last training conducted incountry by the 1st Combat Aerial TOW team was replacement training. Due again to the tactical situation at that time (no tanks and few other targets remained) and weather in the operational area (the monsoon season had started) each aviator replacement was afforded the opportunity to cross-train as a pilot and as a copilot/gunner. The training given to the replacements was considered more than adequate . . . they had combat tried and proven instructors and equipment to help them learn.

Committed on 2 May, the 1st Aerial TOW Team was engaged in the Kontum area in combat until 12 June with dramatic success! During their short but effective stay the team's devastatingly effective TOW engagements brought forth convincing results while the aircraft received no hits from hostile fire and maintained a 100 percent availability rate. This is truly a first for Army aviation and contributes conclusive evidence of the value of the attack helicopter as an antitank weapons system.

After training their replacement crews, the team returned to the United States on 22 June, leaving the TOW missile systems and aircraft behind, confident through firsthand knowledge that . . . TOW WORKS!

IT WAS JUST another of those "ho hum" training flights. I was flying solo on minimum light approaches at the parallel strip at Biggs Army Airfield, Ft. Bliss, TX, in an OH-58A/T. The date: 24 April 1973. The time: 2050 hours. Visibility was limited due to a dust haze mixing with darkness. Winds were gusting from west-northwest at 18 knots.

Suddenly, Biggs Tower called with an emergency. El Paso International Airport had reported that N55115 Piper Cherokee 180 was on a VFR flight plan from San Antonio to El Paso and did not have enough fuel to land at El Paso. The Cherokee was about 30 miles to the southeast. Biggs wanted to know my fuel situation and if I would attempt to locate and assist the Cherokee to make a safe landing. I had some 300 pounds of fuel and of course I was more than glad to try and help.

Biggs Tower gave me permission to take off from the parallel to the west with instructions to make a 180-degree turn to the east and

Captain George W. Lang Jr.

My most rewarding experience was the resounding exclamation

WOW! BEAUTIFUL!

contact El Paso Approach Control. El Paso gave me a transponder code and heading direction with instructions to contact Albuquerque Center for vectoring instructions to the Cherokee, since Albuquerque was working the aircraft.

Shortly after contacting Albuquerque and picking up my intercept heading, I heard the Cherokee pilot report that his fuel was exhausted and that he wanted to execute a maximum glide descent. Meanwhile, I was northwest at 5,500 feet approaching U. S. Highway 180 that runs east and northeast from El Paso to Carlsbad, NM.

Realizing that the situation was serious, I intensified my efforts to locate the Cherokee. Poor visibility and numerous ground lights hampered me, but fortunately I spotted his navigation lights southeast of the highway at about 9,000 feet.

As the Cherokee continued to glide to the northwest, the pilot was having trouble locating Highway 180, which he wanted to use as a forced landing strip. This was in spite of the fact that Albuquerque was giving him position reports in relation to the highway via radar positioning update.

About this time I crossed over the highway and reported my position and the circumstances to Albuquerque. This was passed on to the Cherokee pilot who acknowledged my position. He said that he saw what he believed were automobile lights and would proceed to align his aircraft for the descent to the highway.

I started a wide turn to the right, south of the highway, to give the Cherokee plenty of maneuvering room as he approached from the southeast to the northwest. I noticed he was not attempting a dog-leg to his left and was not aligning his aircraft with the southwest to northeast direction of the highway.

When the pilot reported that he could not locate the highway, I immediately started a left turn so I could fall in behind him. He wanted me to fly ahead and mark the highway for him, but I couldn't do this because his descending speed was too great for me to overtake him. Instead, I offered to guide him as best I could from the rear.

The Cherokee then was in a fast descending attitude just south of the highway and the approach was almost directly aimed to intersect it rather than parallel it. With this approach attitude and altitude, there was no way to abort and make a correct approach.

I called the pilot and told him the road was to his left and that he was heading wrong. He answered that for a while he thought he had the highway in sight but had lost it. I advised that he was approaching the highway but had to turn left.

The strain on my nerves had begun to tell. I don't remember exactly what happened next, but the Cherokee pilot answered my left turn advice by questioning whether I was referring to his left or mine. I yelled back for him to make a left turn—*a hard left!*

The pilot responded by making almost a 90-degree left turn and miraculously found himself aligned with the highway. He made a fast recovery and landed on the highway without any apparent aircraft damage.

Fortunately, traffic was very light at the time of the forced landing—the only vehicles nearby were traveling in the same direction as the aircraft and well ahead of it. As soon as his aircraft stopped rolling, the Cherokee pilot pushed his airplane to the right side of the roadway. Then he used his flashlight to warn approaching vehicles. I flew overhead making low passes at approaching vehicles to warn them with my landing lights until the highway patrol took charge. It was 2120 hours when I left to return to Biggs AAF.

The most rewarding factors of this episode are not the slaps on the back or the letters of appreciation I have received, but rather the exclamation which came across the radio, loud and clear, when the Cherokee pilot finally executed the harrowing 90-degree left turn and found himself over the highway: "Wow! Beautiful!"

a penny saved

CW2 Robert Browning

Instrument Instructor Pilot
Department of Undergraduate Flight Training
U. S. Army Aviation School

Besides saving money, flight simulators have become a more significant part of our training program during the fuel/energy crisis

OVER THE YEARS there have been many proposals of ways to reduce the cost of military flight training. One of the best is the flight simulator. By employing a flight simulator, an aviator can be trained for a monetary price which is substantially less than that of a comparable aircraft. This can be seen by taking a look at the historical background of simulators.

On 20 July 1969 man first landed on the moon. But astronauts Neil Armstrong and Edwin "Buzz" Aldrin had been through the maneuvers necessary for this landing of their spacecraft thousands of times—thanks to the *lunar module mission simulator*.

True, the simulator employed in the training of the astronauts for their moon landing, like most of the equipment used in the lunar mission, was the most sophisticated ever built. But it must be remembered that simulation is not a newcomer to aviation. Since the early flights of man, simulators have played an important part in his flight training.

The man who is generally credited with planting the seed that grew into today's vast simulator industry is named Edwin Albert Link. In the years since he built his first "pilot-maker" in 1929, the company he founded has supplied trainers by the thousands to civil aviation, the armed forces and the space program.

Besides being expensive the airplane was, in Ed Link's view, a terrible place to learn to fly. It was noisy, bumpy, uncomfortable, unstable and generally frightening to a student. The wonder was that anyone learned the delicate art of piloting an airplane in this hostile and anxiety-producing environment.

It was Ed Link's belief that the best place to get the rudiments of flying was in a training device, firmly rooted to the ground and situated in a warm and friendly classroom atmosphere. In such a trainer students could become familiar with the controls, responses and instruments of an airplane before leaving the hangar.

While Ed Link's primitive efforts were a step toward a valuable form of simulation, it was not until 1931 when the U. S. Navy purchased one trainer at a cost of $1,500 that its real value was brought to light. The Navy immediately realized the value of this device when Ed Link taught an officer, who had never been in an airplane before Ed's arrival, to fly by instruments.

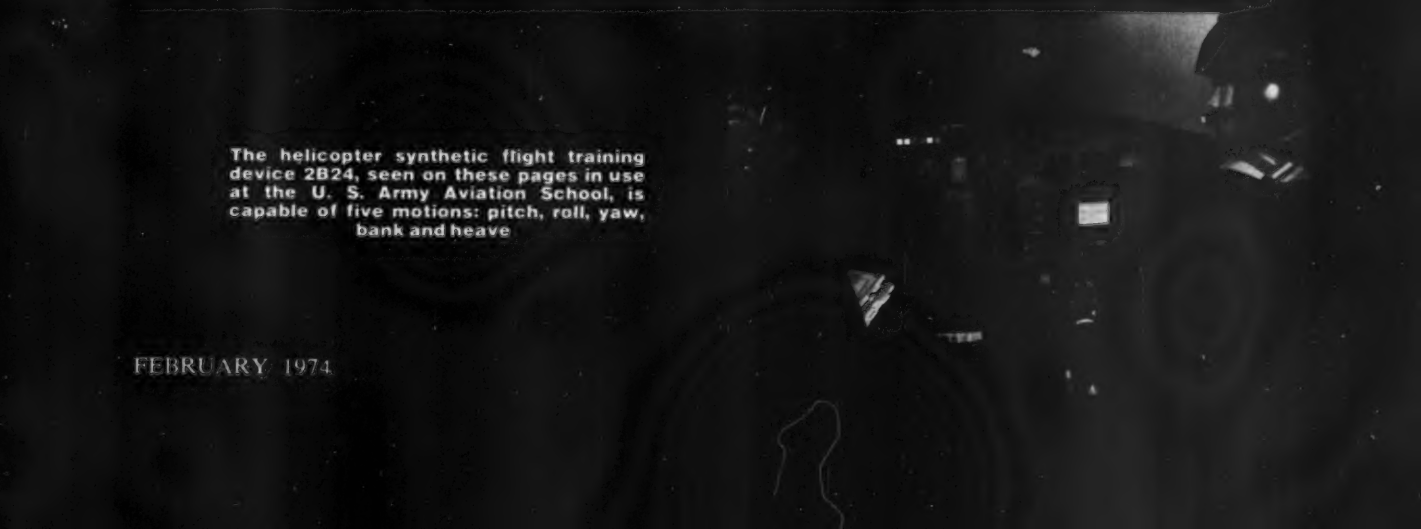
During the next couple of years Link continued to work on his invention, and then in February 1934 the Army purchased six Link model "A" trainers. A new industry was born.

Through the next 10 years Ed Link expanded his basic trainer and incorporated improvements in each new model. Meanwhile, Ed's interests spread to other than the basic aircraft instrument trainer. Ed Link built what was perhaps one of the most complex and most admired of his World War II trainers. This was none other than the celestial navigation trainer which reduced the flight training time of bomber crews by 50 percent.

At the end of World War II a major switch was made in the design of the flight trainers—from a motion to a stationary trainer. Along with the stationary trainer came the introduction of an electronic computer. Then in 1949 the U. S. Air Force awarded Link a contract to build a simulator for the F-80 jet trainer. This was the first piece of ground equipment ever built to duplicate the operation of a jet-powered aircraft. All of the controls and instruments of this simulator functioned just as they would in actual jet flight.

As jet aircraft have increased in complexity and sophistication, so have the simulators. One of the best examples of this is the helicopter synthetic flight training systems (SFTS) which is used by the U. S. Army Aviation School at Ft. Rucker, AL [see "SFTS," September 1972 AVIATION DIGEST].

The SFTS is a generation in advance of simulators in current use by military and commercial aviation. It enables one simulator controller to control four cockpits simultaneously through extensive application of computer-controlled learning situations, an advanced motion system and a comprehensive pilot measurement system for



The helicopter synthetic flight training device 2B24, seen on these pages in use at the U. S. Army Aviation School, is capable of five motions: pitch, roll, yaw, bank and heave

a penny saved

CW2 Robert Browning

Instrument Instructor Pilot
Department of Undergraduate Flight Training
U. S. Army Aviation School

Besides saving money, flight simulators have become a more significant part of our training program during the fuel/energy crisis

OVER THE YEARS there have been many proposals of ways to reduce the cost of military flight training. One of the best is the flight simulator. By employing a flight simulator, an aviator can be trained for a monetary price which is substantially less than that of a comparable aircraft. This can be seen by taking a look at the historical background of simulators.

On 20 July 1969 man first landed on the moon. But astronauts Neil Armstrong and Edwin "Buzz" Aldrin had been through the maneuvers necessary for this landing of their spacecraft thousands of times—thanks to the *lunar module mission simulator*.

True, the simulator employed in the training of the astronauts for their moon landing, like most of the equipment used in the lunar mission, was the most sophisticated ever built. But it must be remembered that simulation is not a newcomer to aviation. Since the early flights of man, simulators have played an important part in his flight training.

The man who is generally credited with planting the seed that grew into today's vast simulator industry is named Edwin Albert Link. In the years since he built his first "pilot-maker" in 1929, the company he founded has supplied trainers by the thousands to civil aviation, the armed forces and the space program.

Besides being expensive the airplane was, in Ed Link's view, a terrible place to learn to fly. It was noisy, bumpy, uncomfortable, unstable and generally frightening to a student. The wonder was that anyone learned the delicate art of piloting an airplane in this hostile and anxiety-producing environment.

It was Ed Link's belief that the best place to get the rudiments of flying was in a training device, firmly rooted to the ground and situated in a warm and friendly classroom atmosphere. In such a trainer students could become familiar with the controls, responses and instruments of an airplane before leaving the hangar.

While Ed Link's primitive efforts were a step toward a valuable form of simulation, it was not until 1931 when the U. S. Navy purchased one trainer at a cost of $1,500 that its real value was brought to light. The Navy immediately realized the value of this device when Ed Link taught an officer, who had never been in an airplane before Ed's arrival, to fly by instruments.

During the next couple of years Link continued to work on his invention, and then in February 1934 the Army purchased six Link model "A" trainers. A new industry was born.

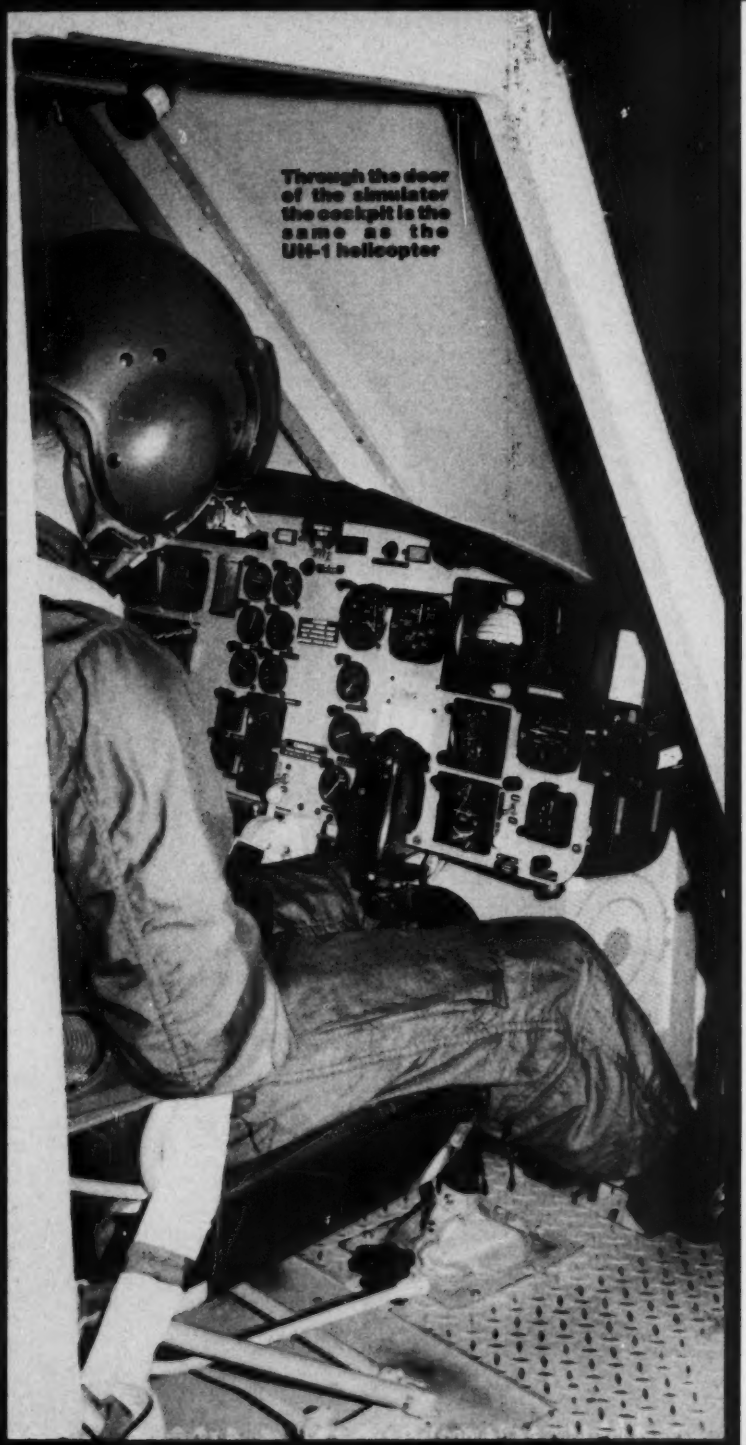
Through the next 10 years Ed Link expanded his basic trainer and incorporated improvements in each new model. Meanwhile, Ed's interests spread to other than the basic aircraft instrument trainer. Ed Link built what was perhaps one of the most complex and most admired of his World War II trainers. This was none other than the celestial navigation trainer which reduced the flight training time of bomber crews by 50 percent.

At the end of World War II a major switch was made in the design of the flight trainers—from a motion to a stationary trainer. Along with the stationary trainer came the introduction of an electronic computer. Then in 1949 the U. S. Air Force awarded Link a contract to build a simulator for the F-80 jet trainer. This was the first piece of ground equipment ever built to duplicate the operation of a jet-powered aircraft. All of the controls and instruments of this simulator functioned just as they would in actual jet flight.

As jet aircraft have increased in complexity and sophistication, so have the simulators. One of the best examples of this is the helicopter synthetic flight training systems (SFTS) which is used by the U. S. Army Aviation School at Ft. Rucker, AL [see "SFTS," September 1972 AVIATION DIGEST].

The SFTS is a generation in advance of simulators in current use by military and commercial aviation. It enables one simulator controller to control four cockpits simultaneously through extensive application of computer-controlled learning situations, an advanced motion system and a comprehensive pilot measurement system for

The helicopter synthetic flight training device 2B24, seen on these pages in use at the U. S. Army Aviation School, is capable of five motions: pitch, roll, yaw, bank and heave



performance analysis. At the Aviation School each initial entry student has a qualified instrument instructor with him in the cockpit who actually conducts the instruction.

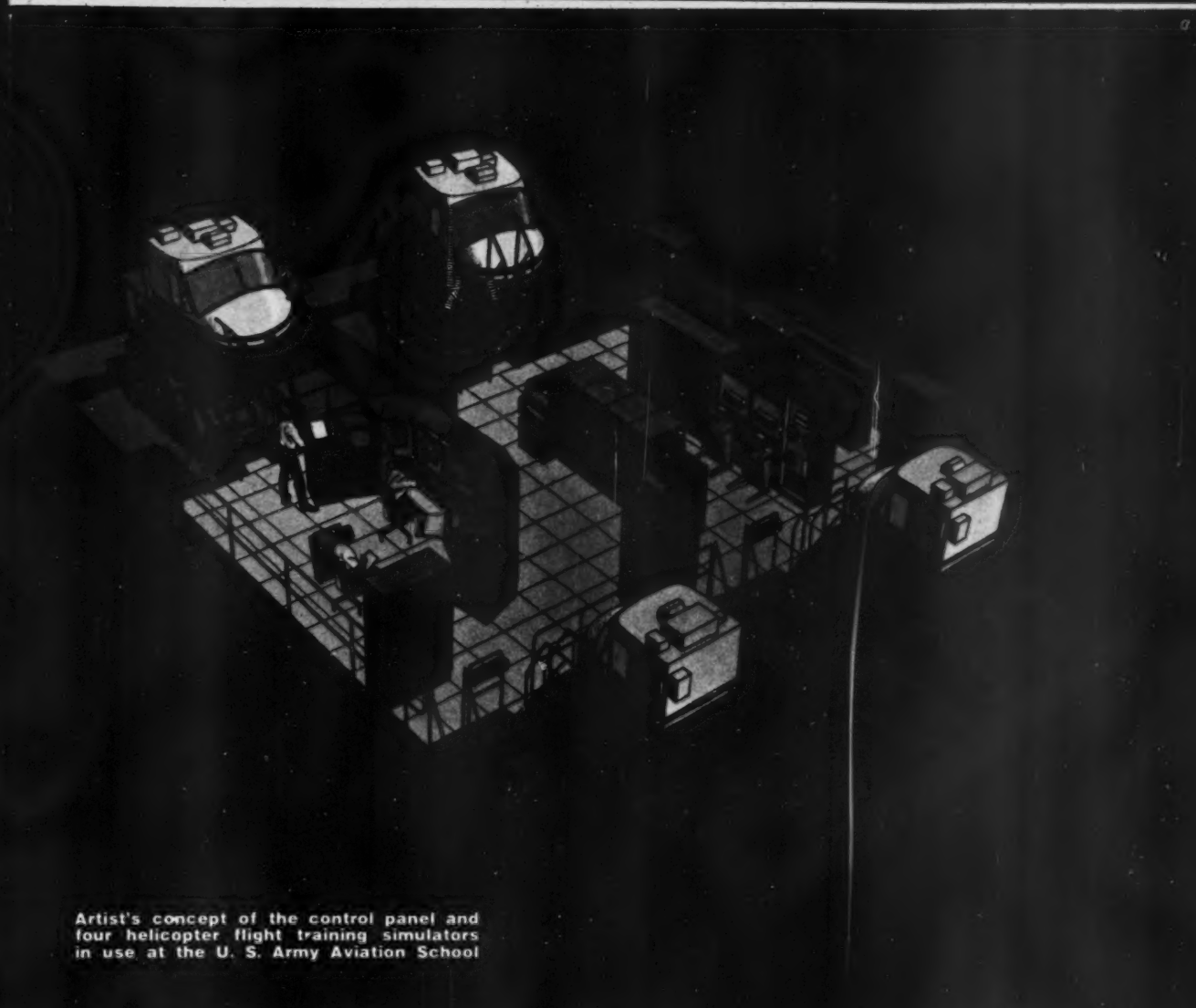
Each of the four training stations duplicates the actual aircraft cockpit and includes a 5 degree of freedom motion system, providing pitch, roll, heave, yaw and lateral translation. New design advances incorporated in the trainer also capture, in high-fidelity, actual rotor aerodynamic characteristics. The resultant realism enables the pilot trainees to experience all the motion cues of helicopter flight including such problems as power failure, control malfunctions and the inevitable rough air. Actual cues such as engine and blade sounds are also included.

The typical SFTS mission at the School begins with a preflight briefing conducted by the instructor pilot. The instructor covers the day's flight period and explains each area to be covered in detail. The instructor and student then proceed to the trainer where the actual training is conducted and controlled by the instructor pilot.

During the flight the computer measures the trainee's performance and it may be employed to make the lesson easier or more difficult according to the individual's progress. The level of difficulty may be varied by modifying such factors as turbulence, malfunctions and communications load.

During the flight plots are made of the ground track for both cross-country and approach modes and records are kept on any aircraft parameters desired such as air speed and altitude. Recording of air-ground communications is also made. These plots are used by the instructor for debriefings and critique.

So, as you see, flight simulation has advanced a giant step from Ed Link's first bellows operated "pilot-



Artist's concept of the control panel and four helicopter flight training simulators in use at the U. S. Army Aviation School

maker." However, the age of sophistication has not stopped at this point. One of the newest and most welcomed advances on the horizon is an automated visual system. This system has produced some very encouraging results and is one of the bright spots of the future.

The history of flight simulation accounted here highlights only a few moments of an ever-expanding industry. But it brings us to the point of this article: Does the use of flight simulators actually cost less than the actual aircraft? Remember, Ed Link proved that he could teach somebody to fly for less in his trainer ($10.00 per hour) than in his airplane ($50.00 per hour).

During the last 10 years many if not all of the large commercial airlines have started to use simulators for a larger portion of their pilot training. America's domestic air carriers have recognized the value of flight simulators. By 1971 some airlines were conducting in the vicinity of 60 to 75 percent of their pilot training using simulators. It's easy to understand why. The hourly cost to train pilots in a simulator is significantly less, about $150 as opposed to $1,600 for a Boeing 747 aircraft. Comparative costs for instruction vary among aircraft, however, simulator expense is generally 10 to 20 percent of the actual aircraft cost per training hour.

The airlines also have found that flight crews tend to be more proficient and safety oriented as a result of their simulator time. It is quite obvious that substituting simulator time for actual flight time is not only convenient but it is also economically sound. The addition of sophisticated flight simulators to any military flight program would be a welcomed asset for both economy and safety. As the old saying goes, "A Penny Saved. . . ."

Training is about to begin

The letdown

Training To Ditch

MEMBERS OF THE U. S. Army Aviation Detachment, Camp Zama, Japan, held training exercises recently in how to escape from an aircraft which might be forced to ditch over water. The training was conducted in a swimming pool at the U. S. Army Supply and Maintenance Activity in Sagami during a 2-day period.

Pilots, crewchiefs and mechanics from the detachment boarded a bus at Rankin Army Airfield for the ride to the Sagami Depot. Unseasonable cold, rainy weather failed to dampen their enthusiasm for the special training, conducted for the first time for detachment personnel.

The "aircraft" used for the special training was an old fixed wing type which had been completely stripped, with the tail, wings and glass removed. Cables were attached to the top of the trainer so it could be lifted with a small crane and dropped into the water.

The concept for the training was simple but simulated realistically what an escape from a submerged aircraft would be like.

First, a crewmember donned a flight helmet and Mae West life

The exit

When clear of aircraft life vest can be inflated

Trainer is submerged

Photos by Staff Sergeant Raymond Denis and Specialist 5 Gerry Simons

jacket. Then he entered the trainer and was securely strapped into the cockpit with a seat belt and shoulder harness.

With the pilot buckled into the "craft," it was lifted by the crane and swung out over the water where it hung for a moment or two. Then the crane operator dropped the trainer into the water where it quickly bubbled out of sight.

Following instructions to wait until the craft had stopped rolling, the pilot unfastened his seat belt and shoulder harness and made his exit from the craft.

Swimming free of the trainer, he popped the inflating mechanisms on his Mae West and bobbed to the surface of the water, where he was "rescued" after his emergency landing.

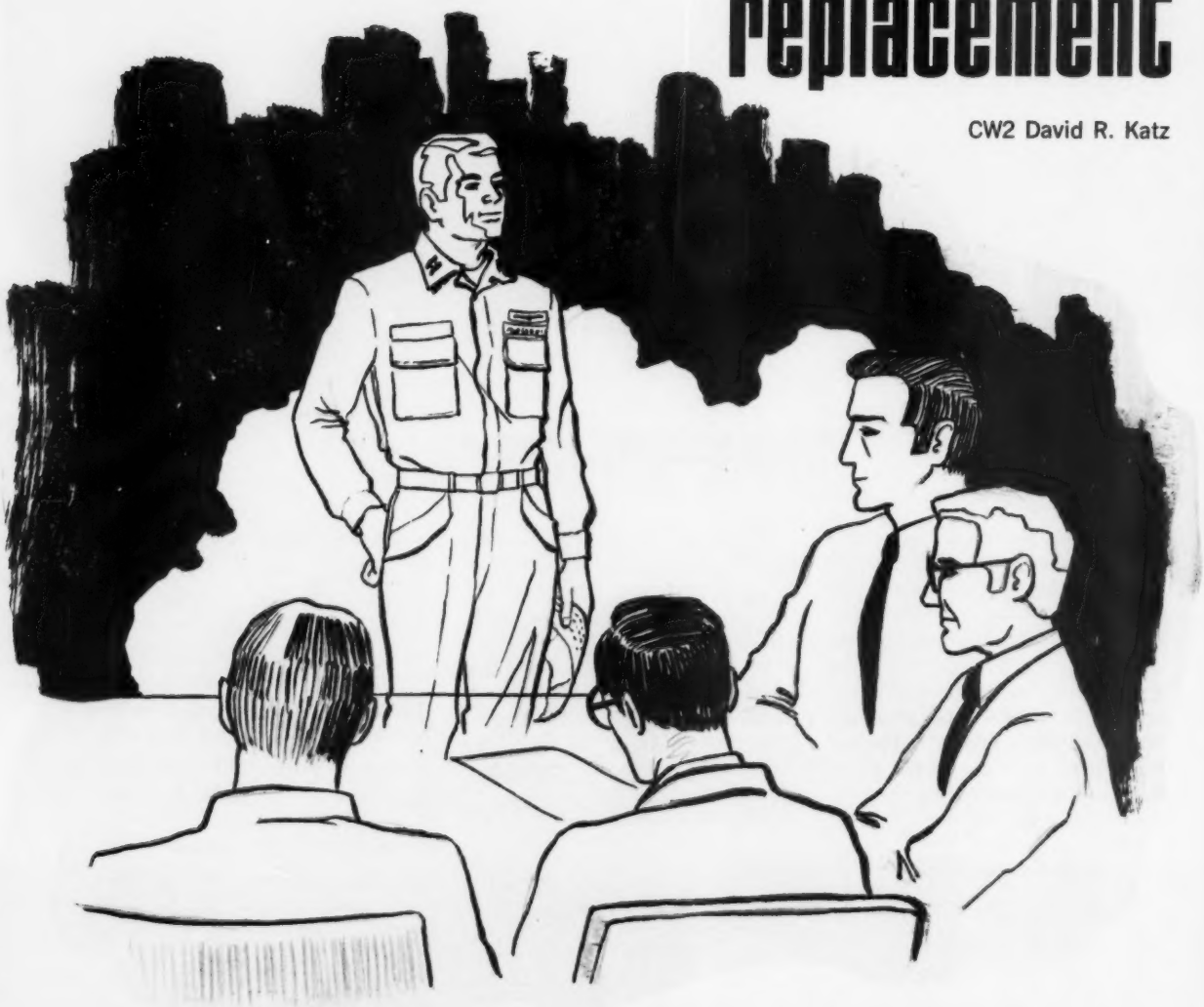
Despite the wet weather conditions every man in the aviation detachment, from commander to crewchief to clerk, underwent the training. Some enjoyed it and the 80-degree water in the pool so much that on their return to the airfield they were already volunteering for their next training exercise.

Training complete at the surface

he was picked to be ...

the replacement

CW2 David R. Katz



THE ROOM WAS veiled in silence. Only the occasional whisper of small talk was heard exchanged between two of the men that surrounded the conference table. All the seats were filled except the head. The ash trays, memo pads, water glasses and name plates were symmetrically arranged. A man entered from the door behind the empty chair and all the other men stood.

"Keep your seats, gentlemen," he said quietly. "We've convened today to choose a replacement for Lieutenant Colonel George R. Egroeg who was killed in an aircraft accident yesterday. I've asked you all to be ready with your recommendations."

The man sitting behind the name plate that simply read "PO" drew on the memo pad as he slowly raised his hand.

"Yes?" the chairman said.

"Sir, I feel that the position is too important to be filled again by a lieutenant colonel. I would like to suggest a brigadier general."

A youthful looking man at the end of the table interrupted.

"No, no sir!" Identified only by the plate that he was now glaring over as "I," he wore the latest style of clothes and was very neat and well groomed. "I feel that the rank of the individual is secondary to the qualifications he must hold. There's no need. . . ."

The chairman interrupted, "I agree with you. The rank is basically immaterial. In 1968 the position was filled with a brigadier general and, while his performance was excellent, the prestige gained by his rank faded very rapidly after he completed the job. We will, therefore, confine our support of our recommendations to the qualifications of the individuals."

The first man, still looking at his memo pad, said, "Sir, under just the consideration of personal qualifications, I place before this committee the name of Brigadier General Howard C. Feldniel."

There were several nods around the room and murmurs of approval.

"He has an outstanding military record, highly decorated and graduated third in his class. His only negative quality, if you want to call it that, is that he gets so involved in his work that he is not aware of what is going on around him."

He was sure that his nomination would win and that would be good for his own career.

The young man at the end of the table stood up and with a raised, rapid voice said, "Sir, I place before this committee the name of Captain Charles X. Neerg."

"Sit down!" the chairman said, "this is not a high school class election and you will all have a chance to express your preferences and dislikes. Now continue."

Sitting, the young man said, "The captain is a graduate of Massachusetts Institute of Technology, with a masters degree in mathematics, had two tours in the Republic of Vietnam—the first with the 5th Special Forces when he won the Distinguished Service Cross."

One of the other men at the table broke in saying, "He is relatively young. It is hard to project the proper image at 26."

The younger man replied, "Age is not what I call a qualification. If it were the limiting factor should not be the lack of it but the overabundance of it!"

"Gentlemen," the chairman again interrupted, "I would like us all to be civil so we can expedite the selection as much as possible. So far we have two names placed before us. Are there any others?"

The meek looking man behind the name plate "IE" simply said, "I think Warrant Officer Joseph E. Navills would be good for the position. He is not well educated like the other two gentlemen, but he has a lot of enlisted time and I think we all know that he could fit the requirements of the position quite adequately."

There were murmurs of concurrence.

"Are there any other names?" the chairman questioned. "Shall we put it to a vote then?"

The slips of paper were neatly folded as one after another they were passed to the chairman. As he opened each one he marked the vote on his memo pad.

"Gentlemen," he said rising, "the majority of the votes cast are for the captain to replace Lieutenant Colonel Egroeg. I'll leave it to the three persons nominating the replacements to notify the captain tomorrow. This committee will remain on call of the chairman. Good day."

All the men rose and after the chairman left the three men agreed to meet at the airfield operations the next afternoon to notify the captain of his selection.

The next day was clear and the three had arranged to be on a flight in which Captain Neerg was to fly the post commander to a conference several hundred miles away. The takeoff was delayed by slow refueling. This upset the captain, who was anxious to impress the commander. He skipped through his preflight in an attempt to make up lost time. This was observed by the committeemen. They agreed that indeed they had made a good selection.

After they were airborne the young man, proud that his nominee had been selected, handed the captain a letter that read:

Greetings:

You have been selected by the Accident Causation Committee to be the replacement for LTC George R. Egroeg. You are dead!

DEATH, Chairman of the Board

MEMBERS

Preoccupation	**Overconfidence**	**Self-medication**
Impatience	**Childishness**	**Cockiness**
Inexperience	**Neglect**	**Self-reliance**
Inattention	**Irresponsibility**	**Ego**

There *will* be a replacement for each death in an aircraft accident and one of these boardmembers may have a hand in selecting the "replacement." Don't let one of these members be the cause of your selection!

to enhance aircrew performance

Human Behavioral Conference

Major Donald I. Saathoff
Chief, Doctrine Division
Concepts, Organization and Doctrine Dept.
Deputy For Developments
U. S. Army Aviation School

MILITARY AND CIVILIAN planners, research scientists and operational personnel met last November at Ft. Rucker, AL, to identify the Army's requirements for behavioral research to enhance aircrew performance.

Current work areas were discussed with emphasis on rotary wing crews during the 3-day seminar sponsored by the Army's Office of the Chief of Research and Development with the assistance of the U. S. Army Research Institute for Behavioral and Social Sciences and the Army Aviation Center and School at Ft. Rucker.

The conference, entitled "Aircrew Performance In Army Aviation," helped lay the groundwork for developing an integrated program of behavioral research. It featured formal presentations; open discussions in assembly and small groups; and follow-up informal reports from the discussion groups.

Four main topic areas relating to the performance of helicopter crews were covered by the speakers:

- Operational and equipment factors.
- Environmental and safety factors.
- Training and simulation (see "Tomorrow's Rotary Wing Training Requirements," December 1973 AVIATION DIGEST).
- Performance requirements and assessment.

Operational and Equipment Factors: Major Matthew R. Kambrod, Office of the Assistant Chief of Staff for Force Development, assessed the impact of the future combat environment on aircrew performance requirements. He examined the projected enemy threat in terms of the combat tasks imposed on helicopter aircrews and the performance proficiency demanded of them.

Mr. Stephen Moreland, U. S. Army Aviation Systems Command, discussed the impact of future airframes on the skills and tasks possessed by the aircrew and included a projection of the effect of new airframes on crew system design and behavioral research requisites.

Mr. Marvin W. Buss, U. S. Army Materiel Command, described the Army attack helicopter's new design features and the new performance essentials of both crew and equipment. He made an assessment of the efforts necessary to integrate these design features and needs into an effective weapon system which can be operated, maintained and supported by the organizations and personnel of the Army.

Continuing along in the operational and equipment factors area Major James A. Burke, U. S. Army Air Mobility Research and Development Laboratory, described a simulation experiment which defined low-speed control deficiencies in the UH-1 helicopter related to pilot performances in steep spiral approaches. The vertical and short take-off landing (VSTOL) display and instrument landing system (ILS) used in this evaluation also were discussed.

Mr. Clarence A. Fry, U. S. Army Human Engineering Laboratory, reviewed the increasing complexity of Army aircraft cockpits in historical perspective, and in this view he examined nap-of-the-earth (NOE) operational problems as they relate to the crew station. He discussed relevant human engineering laboratory programs and presented a summary of future cockpit requirements.

Environmental and Safety Factors: Colonel Lee M. Hand, U. S. Army Avionics Laboratory, presented covered research conducted by the Avionics Laboratory to define the avionic equipment characteristics required to operate Army aircraft at low altitudes under night and limited visibility conditions. He summarized planned Avionics Laboratory programs in support of low-level night airmobile operations.

Mr. Karl Stich and Mr. David Helm, U. S. Army Night Vision Laboratory, presented results of research conducted to improve Army helicopter crew

Among the personages attending were Major General William J. Maddox Jr., Commander of Fort Rucker and Commandant of the Army Aviation School; Major General Charles D. Daniel Jr., Director of Army Research and Development, Office of the Chief of Research and Development; Major General Elmer R. Ochs, Commander of Army Operation Test and Evaluation Agency, Fort Belvoir, VA; Brigadier General James H. Merryman, Director of Army Aviation, ACSFOR, Washington, DC; and Dr. Julius E. Uhlaner, Army Chief Psychologist of the Army Research Institute

performance during low-level night operations. Included in their presentation were man-machine interrelated (interface) problems, hardware development and flight test results of some operational systems.

Captain Richard G. Johnson, Defense Mapping Agency Topographic Center, described the development of new map products for Army aviation, featuring maps with improved night readability and highlighted aviation information.

Captain Johnson presented recommendations for additional basic research on pilot responses to map content and symbology and on the utility of image-based products for aviation to further improve charts used by aviators in the future.

Colonel Robert W. Bailey, U. S. Army Aeromedical Research Laboratory, examined several variables found in the rotary wing environment such as noise, communications, visibility, fire, safety design, displays and controls as these relate to various flight profiles, including nap-of-the-earth flight. Colonel Bailey discussed the implications for crew performance and he summarized relevant studies.

Mr. Darwin S. Ricketson, U. S. Army Agency for Aviation Safety, described a new approach to helicopter safety in which pilot error is viewed as the result of pilot overload caused by out of tolerance conditions among aviation system elements.

Training and Simulation: The third major topic area as it related to the performance of helicopter crews was training and simulation. Major Carl A. Weaver Jr., U. S. Army Aviation School, placed in perspective the determination of future rotary wing aircrew training requirements. Major Weaver also analyzed aircraft systems, the operational environment and tactics, and mission demands of the future as they pertain to expected training implications.

Major Donald I. Saathoff, also representing the U. S. Army Aviation School, examined the impact of nap-of-the-earth tactics on initial entry students and on unit training requirments. He surveyed factors that influence pilot performance in nap-of-the-earth flight, identified training research requirements and recommended priorities.

Dr. Wallace W. Prophet, Human Resources Research Organization, examined flight simulation in terms of existing and potential applications for current and future Army systems.

Dr. W. Guy Matheny, Life Sciences, Incorporated, explored the problem of specifying the desired characteristics of training simulators, particularly with respect to motion and visual simulation. He also presented a perceptual equivalence approach for estimating training effectiveness as an alternative to the classical transfer-of-training comparison currently used.

Performance Requirements and Assessment: Dr. John P. Farrell, U. S. Army Research Institute for the Behavioral and Social Sciences, presented a general review of the various techniques for measuring the performance of helicopter pilots.

Major William E. Whitworth, U. S. Army Combat Developments Experimentation Command, described field studies of aircrew performance in nap-of-the-earth operations.

Dr. John W. Senders of the University of Toronto described a study in which the relative demand for visual information by pilots flying a captive helicopter was measured with a visual occlusion device which permitted voluntary observing.

Dr. Dora D. Strother, Bell Helicopter Company, presented a paper entitled "Visual Activities of the Helicopter Pilot During Low Altitude, VFR Flight."

Mr. Donald Vreuls and Mr. Richard W. Obermayer from the Canyon Research Group, Incorporated, illustrated an approach to quantitative, machine-derived measures of aircrew performance by a measurement selection study in a captive rotary wing device. They examined the steps involved in measurement selection and analysis.

Mr. Ronald E. F. Lewis, Defence and Civil Institute of Environmental Medicine, Canada, described the reasons for and advantages of field trials in aircrew performance assessment.

The conference climaxed with the recommended establishment of a formal overall pilot performance improvemnt program as a distinct, unitary entity. It would have detailed, concrete mission criteria, followed by analysis of these criteria to determine what the pilot must do to accomplish the mission and how he should do it. The program would also provide continuing, periodic measurement of how effectively aviators can perform their missions under realistic operational conditions. The Aviation School and operational units would receive systematic behavioral inputs to their training courses and the Army Materiel Command would be assisted in the development of human engineered equipment design and operating procedures.

The entire recommended program will be published in the near future by the Chief of Research and Development.

INSTRUMENT CORNER

Q. There has been some confusion in determining what minimums are required for the selection of an alternate airfield. Can you clarify the IFR alternate minimum requirements?

A. AR 95-1, paragraph 4-24, provides the weather criteria for selection of an airfield as an alternate. An airfield where radar serves as the sole approach aid *will not* be used as an alternate. Radar minimums *will not* be considered when selecting alternate airfields. Paragraph 4-24c states, "Unless current weather forecasts indicate that the ceiling and visibility at that airfield will be at or greater than the following during the period from 1 hour before through 1 hour after ETA:

(1) US Army and FAA procedures: Standard alternate minimums apply unless otherwise higher in DOD FLIP or National Ocean Survey (NOS) IFR alternate listings.

(2) All other authorized procedures: Ceiling —400 feet above and visibility 1½ miles greater than authorized approach minimums.

(3) Aviators flying helicopters may reduce the visibility in (1) and (2) above by 50 percent."

PROCEDURES TO BE USED: If your selected alternate is a U. S. Army or FAA procedure, as listed on the top center of the DOD FLIP approach charts, use the standard alternate minimums or the exceptions thereto, listed in DOD FLIP under IFR Alternate Minimums; i.e., 800-2 for NDB, VOR, LOC, etc., or 600-2 for ILS. The visibility may be reduced by 50 percent for helicopters.

If your selected alternate is other than a U. S. Army or FAA procedure, i.e., USAF or USN, you will then add 400 feet and 1½ miles to the *authorized* approach minimum. Example: If your selected alternate (USAF or USN) has an NDB approach with published minimums of 600-1, the forecast weather must be 1000—2½ to be listed as an alternate for an airplane. Helicopters may reduce the visibility by 50 percent and use 1000—1¼.

Continued from page 1

sures as any controller, civilian or military. A facility with sporadic traffic can be as taxing as a tower with a consistent flow of traffic. This may be because the emotional impact of controlling forces mind and body to work faster, possibly increasing the adrenalin level; creating a state of fatigue and a feeling of being drained.

In the past some pilots have played a game called "catch the controller with his socks down." The result proved that even controllers are human. Today, many pilots are too aware that controllers are human, and often not because of the game. Controllers, like pilots, make mistakes.

Air traffic control has been described as playing three-dimensional chess with a 5 second time limit on all moves. When you consider that each of the pieces in this game carries at least one human life, winning takes on a new meaning.

Responsibility to a controller means more than getting a haircut before being told to do so. It means lives, fragile human lives, that depend on the judgment of a young private or specialist who will have to live with the guilt of an assassin if his decision is wrong.

Perhaps the people who assign ATC sections with guard, Nuclear Accident Investigation Committee, charge of quarters and Security Augmentation Force obligations should also be the pilots who have to face the possibilities of a minimums approach at a Category I airport, served by three instrument approaches, surrounded by traffic from two nearby airports.

Comforting to know that the "little flower in the tower" may have just come off 2 weeks of gate guard, or a week on a Nuclear Accident Investigation Committee drill, or a weekend of sun and fun on the ammo dump fence the same day that every Category B on post is cluttering up your sky while you're test flying a bum slick or giving the commanding officer an instrument check ride.

SP5 Paul R. Stempel
Assistant Tower Chief
Fritzsche Army Airfield
Ft. Ord, CA 93941

Sir:

In the September 1973 AVIATION DIGEST I read with interest the article "EGT vs OAT—and the turbine engine." CW2 Jan E. Lindbak is observant to have noticed the similarity of the two gauges. He states "most pilots are not aware that the OAT gauge and the EGT gauge should read approximately the same temperature in the static position during preflight inspection." He mentions briefly ambient factors that will cause a difference in indication between the two gauges of "two tickmarks or even a little more." The comparison being made is an effort to avoid overtemped condition on UH-1 turbine engines. The ambient factors are more varied than were mentioned, and this comparison, though good, should not be considered a reliable means by which the EGT gauge can be checked.

Overtemp on turbine engines is a very real problem and requires the full attention of both the pilot and maintenance personnel as a joint effort. For this reason, I was surprised at the implication made by Mr. Lindbak when referring to those of us who keep him in the air, the maintenance men, such statements as "any program is only as good as the pilots make it and the maintenance personnel allow it to be." He continues to say "EGT gauges can be made to read anything that the maintenance man wants them to read." Then in closing "pilots take heed and let us help the maintenance man stay honest—and yourselves alive."

It seems that the maintenance man is not one of Mr. Lindbak's favorite people and also that he is not familiar with Army aviation maintenance or a TM 20 or a TM 38-750. If he were he would know discrepancies or faults are recorded on the -13. Maintenance corrects these entries according to applicable maintenance manuals and all maintenance is supervised and inspected by a T.I. as required; but it all starts with the pilots and the -13.

The OAT gauge is not a JETCAL analyzer, merely a device in which outside air temperature is measured and it is located in a position as to be most sensitive to the performance of its function. Similarly, the EGT probes are located to perform their purpose, that of measuring exhaust gas temperature. Like all maintenance performed, the EGT system is inspected, tested or calibrated in accordance with information provided in the technical manual and in this case using instructions furnished with the JETCAL analyzer equipment. Failure of an indicator to meet inspection, testing or calibration requirements as set forth in the TM constitutes replacement. Naturally, if an error exists it is determined whether the fault is the indicator, thermocouple spool resistor or thermocouple lead. Contrary to Mr. Lindbak, spool resistance is not changed to make the EGT gauge read anything the maintenance man wants it to read, but a cool 8 ohms plus or minus 0.05 ohms.

If pilots feel a need to help the maintenance man stay honest, they can start by using the -13. In the event that a pilot has experienced a high EGT reading but not so as to constitute an overtemp condition, he should record it in the -13. Maintenance will be more than glad to check the EGT system for accuracy. Besides, it's easier than replacing the engine or doing a hot end.

SP6 M. L. Wilburn
Standardization Flight Engineer
California Army National Guard
Army Aviation Support Facility
2000 Stimson Road
Stockton, CA 95206

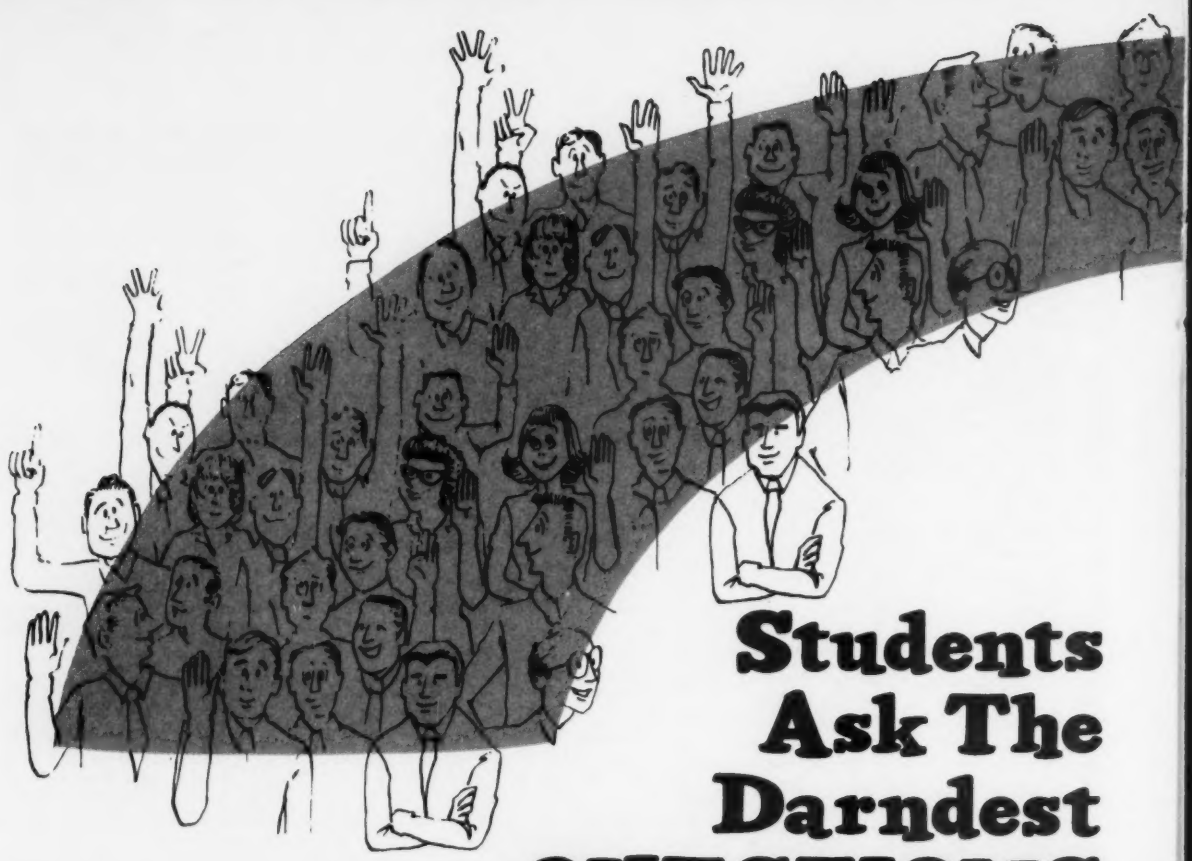
• The DIGEST received the following reply from the Aircraft Logistics Management Division at the U. S. Army Aviation Center, Ft. Rucker, AL:

You're so right, SP6 Wilburn! If the pilot doesn't write it up in the -13, the maintenance personnel won't know if anything unusual happened during the flight. All conscientious mechanics perform calibrations in accordance with the appropriate TM.

Sir:

AVIATION DIGEST is one periodical which I usually read cover to cover as soon as I have received it. However, in the last September issue three articles in particular held my attention. Being from a metropolitan area the noise abatement procedures were very informative and quite helpful. Being a part-time NG Army aviator the "Krispy Kritter" article served well to remind me of past experiences and definitely helps to reinforce reasoning behind usage of survival equipment. And the FL/icing excerpt is one which all Southeast Asia "hot weather" experts should take to heart. Finally, last week I got around to reading "Pinnacle Operations" by our British friend and I must say it is a very encompassing article which gives you everything you need to know about landing (if you have the time). However, the article also gives something you don't need to know about taking off. In the second to last paragraph the flight lieutenant states, "The takeoff from a pinnacle is an *altitude-over-airspeed* takeoff." Then he explains "where airspeed is gained at the expense of altitude." I'm sorry to disagree with him, but the one is not the other. I'm sure what he means to say is the takeoff from a pinnacle is an *airspeed-over-altitude* takeoff, where the idea is to keep the tail out of the trees, let mother earth assist us (by gravity) in achieving our 60 knots, and then pulling in power and climbing to our hearts (or our engineers) content!

CW2 M.S.
5400 W. 63rd Street
Chicago, IL 60638



Students Ask The Darndest QUESTIONS

The disparity of opinion on the proper approach procedures with suspected engine problems in helicopters prompted the writing of this article

Captain James L. Busbee

ON ONE OF THOSE late fall days in southeast Alabama it was business as usual at the U. S. Army Aviation School where an inclement weather class was in session. The Contact Flight Division, Department of Undergraduate Flight Training, was going about the business of transitioning initial entry rotary wing students into the UH-1 helicopter. So, with the instructor doing fancy footwork through the UH-1 emergency procedures, one of our fledglings stopped the show momentarily when he asked, "What type of approach would you make if you're anticipating possible engine problems?"

After a short pause to regroup there was a flurry of opinion, as interesting as it was varied, from instructor pilots and students alike. Careful review of the operator's manual and TM 1-215, Rotary Wing Flight, revealed no black and white answer to that question. That's as it should be because the answer would depend on many variables—terrain, weather, etc. The desired approach is the one that would afford the greatest chance for completing a successful autorotation from any point on that approach.

If it's *known* to the crew that engine problems will occur, a planned autorotation to a prepared area is the ideal solution. In the field that solution is not always practical or possible, so we'll rule out planned autorotation.

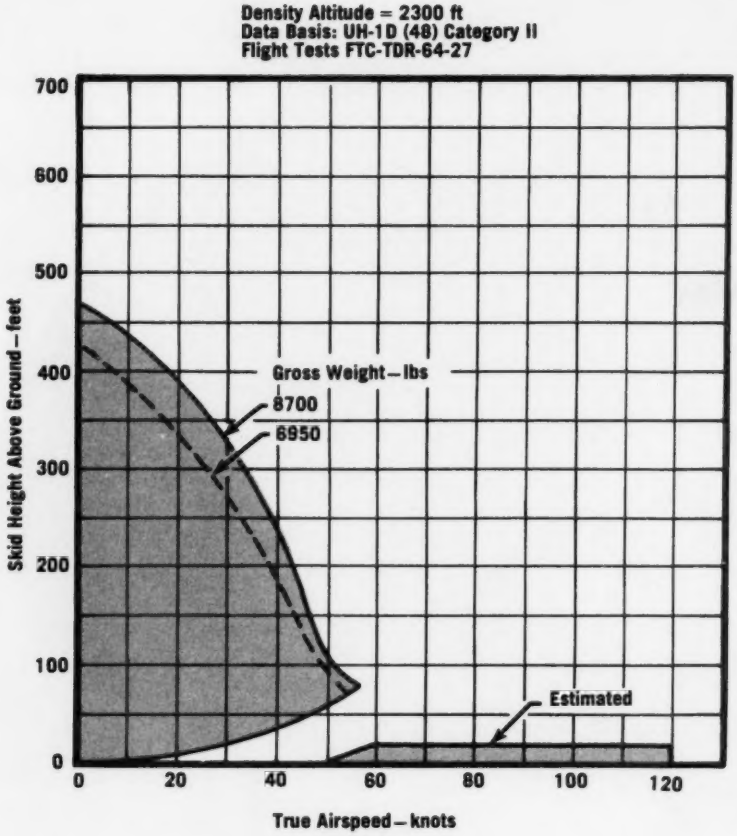
To decide which approach parameters offer the best opportunity to affect a successful *unplanned* autorotation, let's take a look at the possibilities, analyze the variables and relate them to the performance data of the aircraft. We'll use the figures here for the UH-1D/H helicopter.

First off, assume that all approaches will be made with a headwind component. (We know what the word assume spells but any

aviator worthy of his badge knows that's the way to do it, right?) Although the variations for load conditions will not be given, the figures presented will be generally true for all load configurations within the established weight and center-of-gravity limitations.

Now that I'm through covering myself, let's see what *the book* (TM 55-1520-210-10) has to say. Page 4-1, paragraph 4-2, leads off with the statement (our first clue): "The two conditions most likely to affect successful autorotational landings in the event of power loss or engine failure are the altitude and air speed at which the helicopter is operating at the time of failure."

Altitude and air speed are the two things that are constantly varying in an approach. (They really make it tough on a guy, don't they?) How does altitude affect autorotation? How does air speed affect it? How do they work together? I'm not going into what makes the thing autorotate. There have been many outstanding papers on the subject that put it into words better than I could anyway. I will say that the safe altitude to enter autorotation depends upon forward flight speed and pilot's reaction time as well as the char-



WARNING

Avoid continuous operation in red areas. (However, if the aircraft is operated in the red areas, emergency procedures relating to engine failures should be observed in accordance with chapter 4

Height Velocity Diagram

acteristics of a particular aircraft.

Now let's get back to that approach and see how altitude and air speed are getting along. Examining the altitudes and air speeds that may be encountered on an approach, the aircraft may be in any one of the four extreme configurations: high altitude with high air speed; high altitude with low air speed; low altitude with high air speed; low altitude with low air speed (low in this case means approaching zero).

At high altitude with high air speed, such as downwind, base and initial portion of final, an entry to autorotation is no particular problem. The same is true during that portion of the approach immediately prior to touchdown when a low altitude with low air speed configuration exists and a hovering type autorotation can be successfully completed.

Now comes the meat of the question: What type approach? For those who answered steep approach, let's analyze that configuration. With no forward flight speed a helicopter may require several hundred feet to establish successful autorotation, in fact the dash 10 says you need between 425 and 465 feet depending on gross weight (see figure). As air speed increases the altitude needed goes down so that at 50 knots an altitude of 100 feet is required. So for a steep approach angle of 15 degrees starting at 300 feet and 60 knots true air speed (TAS) the flight parameters are inside this "deadman's zone" if the air speed is reduced below 55 knots TAS before going below 75 feet. Any instructor will agree that 55 knots at 75 feet above touchdown and a steep approach angle is excessive. Steep approach is not the answer!

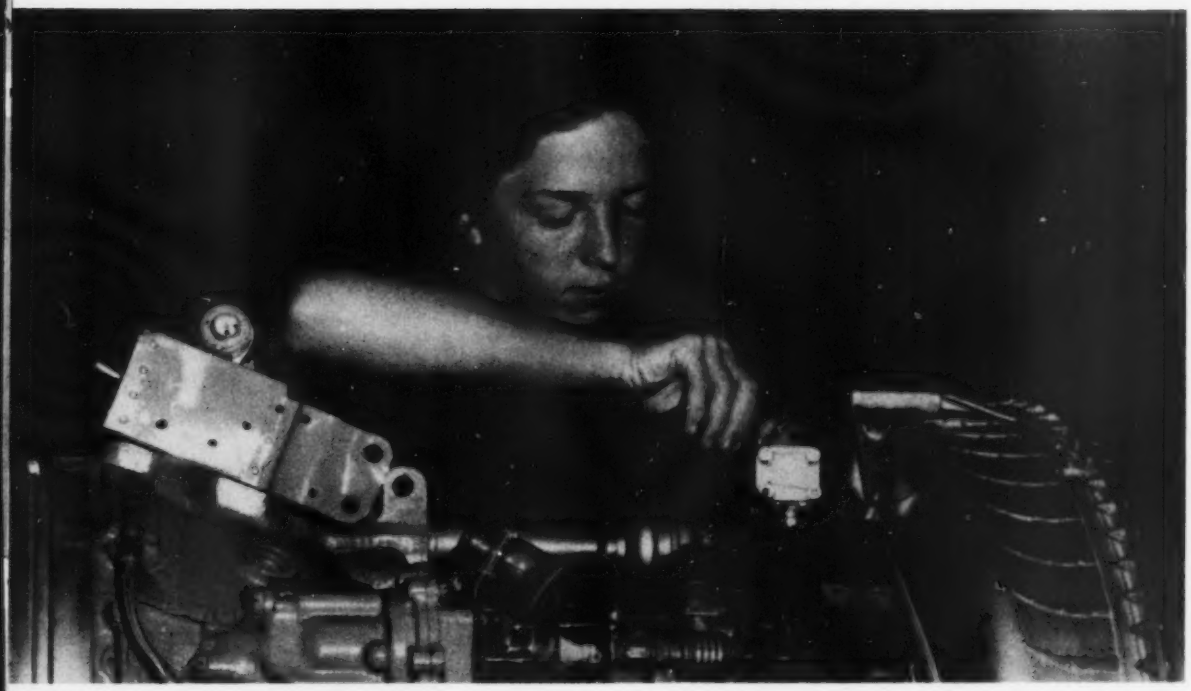
Okay, how about a shallow approach? Even the guys that wrote *the book* have only an educated guess on these figures, but at air speeds above 60 knots TAS an altitude of about 50 feet is required. The unsafe zone at low altitude and high air speed is a function of pilot reaction time as well as energy stored in the rotor system. The catcher here is that at low altitudes the pilot's choice of where he wants to plant the thing is practically nonexistent . . . he takes whatever is in front of him.

Now what's left? You guessed it . . . that normal approach *as taught* in flight school. That means an 8 to 10 degree approach angle from an initial point 300 feet above touchdown with an "apparent ground speed" of 5 knots. A normal approach done by *the book* keeps the aircraft operating right down the middle of the safe zone of the "deadman's curve" and allows the pilot the maximum possible choice of a landing site in the event of engine malfunction.

Now back to the original question: What type of approach would you make if you're anticipating engine problems or a power loss? Simple (under most conditions)—a by-the-book normal approach. But shouldn't every approach, when feasible, be made with the possibility of power loss in mind?

WAC MECHANICS

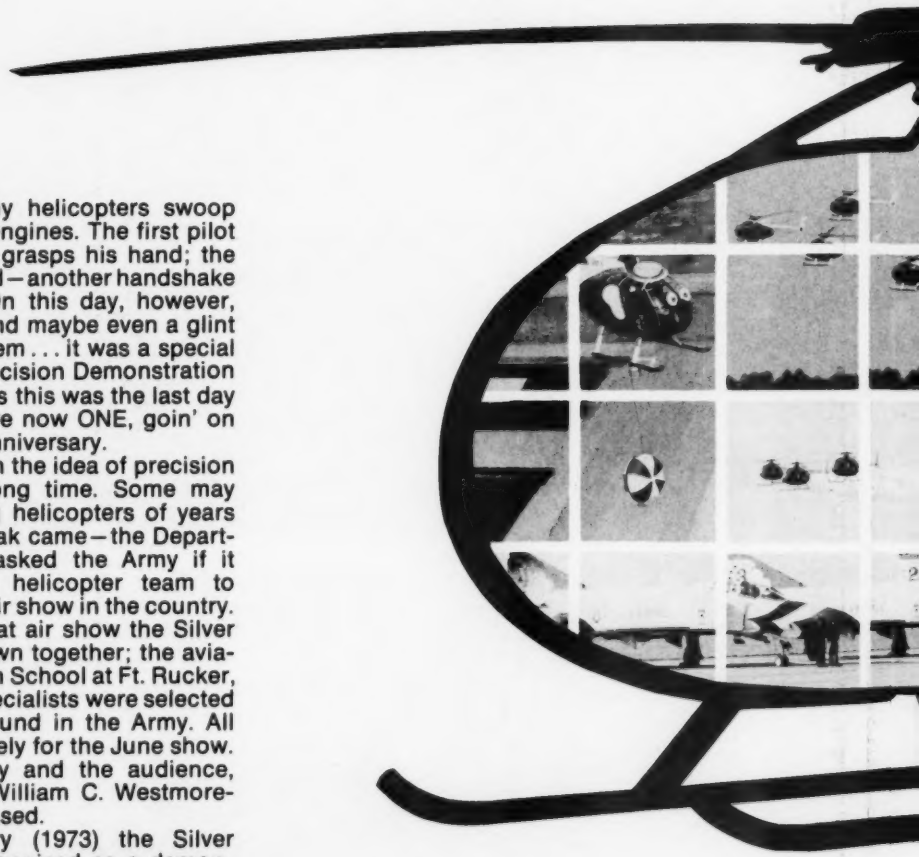
Join Army Aviation Community



Members of the Women's Army Corps (WAC) have created more firsts in Army aviation recently when Private Linda Plock (above) was the first woman to complete the Army's aviation maintenance training course at Ft. Rucker, AL. Private Susan Schionning (left) is the first WAC in the formerly all-male airplane repairman course taught at the U. S. Army Transportation School, Ft. Eustis, VA. Private Schionning's military occupational specialty qualifies her to make a thorough maintenance inspection of the Army's U-8, U-21 and U-1A utility airplanes. Private Plock will work on Army helicopters with the Nebraska Army National Guard

Silver Eagles

Captain Gerald P. Kokenes



SEVEN GLISTENING Army helicopters swoop down, land and cut their engines. The first pilot walks to the second and grasps his hand; the two then approach the third—another handshake and on down the line. On this day, however, there was more warmth and maybe even a glint of a watery eye among them . . . it was a special day for the U. S. Army Precision Demonstration Team; for the Silver Eagles this was the last day of the first year. They were now ONE, goin' on TWO. This was their first anniversary.

The Army had toyed with the idea of precision helicopter flying for a long time. Some may recall the square dancing helicopters of years ago. In 1972 the lucky break came—the Department of Transportation asked the Army if it could send a precision helicopter team to TRANSPO 72, the largest air show in the country. Thus, 3 months before that air show the Silver Eagles were hurriedly drawn together; the aviators came from the Aviation School at Ft. Rucker, AL; the crewchiefs and specialists were selected among the best to be found in the Army. All worked and trained intensely for the June show. They performed flawlessly and the audience, which included General William C. Westmoreland, was genuinely impressed.

The following February (1973) the Silver Eagles were officially recognized as a demonstration team by general order.

During their first year the Silver Eagles have been acclaimed at each of the 52 performances they've made. Audiences have never seen anything like them. "I didn't know helicopters could do that!" is a phrase that has sounded among the crowds who have thoroughly enjoyed helicopter precision flying.

By Staff Sergeant Russ Anderson
Silver Eagles Information Specialist

ON A BEAUTIFUL field grade flying day in March of 1973 some 20,000 aviation fans found their way to Liberal, KS, and the International Pancake Day Celebration. When the day was done, the crowd saw the first show of the Army's official helicopter precision flying team.

Eight months later in New Orleans more than 80,000 devotees of high flight stood at the Lakefront Airport to watch the low flying delicate maneuverings of the tiny buzzing Army helicopters.

When that day was done so was the 1973 season of the U. S. Army Silver Eagles.

In between Liberal and New Orleans, the Silver Eagles performed before more than a million Americans at about 50 air shows. Millions more watched or read about the Army helicopter team via the television tube or the morning paper.

Hopefully, it was a highly successful massive recruiting drive. At any rate, it told America that the Army has aviation with highly skilled pilots to keep 'em flying.

Captain Kokenes wrote this story while Silver Eagles' coordinator

To most spectators it was something novel and new. They had never seen close formation or precision helicopter flying and now they saw seven brightly painted OH-6 helicopters flying as fast as 140 miles per hour, hovering together at high altitudes and displaying perfection in rotary winged flight.

The crowd was told that the Silver Eagles perform the maneuvers taught at the U. S. Army Aviation School at Ft. Rucker, AL. They have also developed some new maneuvers such as the "clover leaf," "starburst," "elevator," "echelon peel off" and other precision maneuvers that require unusual turning and skill. Each aircraft seats a single aviator and each has special designs to allow the pilot to trail different colors of smoke and to operate all of the radios from a single switch.

The feature attraction of the Silver Eagles' performance is the appearance of Bozo The Clown, a helicopter with large flopping ears, flashing nose, yellow hat and twirling eyes. He interrupts the Eagles' show with his superb flying skills by tipping, rolling and placing upright again a large red and white barrel and manipulating a 40-pound real yo-yo from an altitude of 200 feet.

The U. S. Army Aviation Precision Demonstration Team (USAAPDT) was officially designated an Army unit at Ft. Rucker on 15 February 1973 but the team had already performed at TRANSPO 72 near Washington, DC, and other shows during 1972.

The team is organized with 12 officers and 18 enlisted men and has been given the mission to contribute to the public understanding of the role of Army aircraft by demonstrating proficiency and versatility in the performance of precision helicopter flight before both military and civilian audiences.

In conjunction with these demonstrations, the members of the team make personal appearances to demonstrate the unique precision flying capability inherent within helicopter operations; to generate appreciation for the high degree of professional skills, teamwork and responsiveness required in helicopter operations; and to assist the Army personnel procurement effort by stimulating interest in the career opportunities available in the aviation program.

The Silver Eagles comprise an operating team of experienced professional aviators, crewmembers and support personnel who are able to perform the assigned mission in a manner representative of the performance of Army aviation throughout its history.

What Would You Have Done?

The aircraft is a U-6, but that is only incidental

Captain Anthony Geishauser

MOST AVIATORS know what to do as long as everything remains normal, but how prepared are we when the situation changes from normal to abnormal?

What would you have done in the following story? You were a WO1 stationed in Seoul, Korea, and fixed wing rated, flying the U-6 Beaver. The mission: take three colonels to an airfield about 100 miles southwest of Seoul. Weather: 3,000 broken, 5,000 broken, 10,000 overcast, expected to remain like this for the duration of the entire flight.

During preflight and runup the radios were ground checked O.K. With some apprehension about the weather and the radios, the Army aviator took off for his destination on a VFR flight plan.

En route the weather started to deteriorate and the winds were stronger than forecast. Having second thoughts about continuing the flight, he banked his U-6 to look at the weather to his rear and found that it looked worse than what was ahead of him. He decided to give METRO (pilot-to-military weather voice call) a call and report the unforecasted weather and to ask about current weather advisories at his destination. Noticing that the broken condition was becoming overcast, he also decided to call to put himself on an IFR flight plan.

While he was deciding what to do, he found that he had to keep climbing to keep VFR above the rising clouds. The sky condition above was broken to overcast and below was not overcast.

Now that the aircraft was on top, he attempted to call METRO but found the radios to be inoperative. He tried several frequencies but had no luck. The only radio in the aircraft that was working was the ADF.

The altimeter read 7,300 and the winds appeared to be very strong. It was later determined that at 7,000 feet the winds were 85 knots.

O. K., mister, *what would you have done?*

The WO1 elected not to make an instrument approach into his destination airfield because he was not on an IFR flight plan. Another factor in his mind was that he knew that the airfield was between two good sized mountains.

Keeping relatively cool in this tight situation, he squawked 7700 on his transponder and started to hold over his destination airport. Within 20 minutes—to his happy relief—he saw two F-4 fighters fly by him. They circled back, lowered their landing gear and flaps and pulled alongside close enough to give "follow me" instructions.

An alert radar operator from a U. S. Air Force base in the local area responded to the emergency transponder code and these two aircraft were sent to bring the mute bird home. The two Air Force birds led the Army aviator 50 miles east of his last position where he made an IFR descent for about 1,500 feet into a broken condition. He then took over VFR and followed the circling F-4 into the Air Force base.

The transponder is a lifesaver and its use can and will save your life. Know what you have available in the aircraft and use what you have.

"Worth Remembering"

Military Occupational Data Bank

...to improve training, MOS specifications and requirements, MOS testing and other areas that impact the soldier and his job...

Captain Allen R. Tyre
Perry L. Gary, DAC
John A. Yeager, DAC

THE MILITARY Occupational Data Bank (MODB) is a repository of military job analysis data pertaining to almost every military occupational specialty (MOS) in the U.S. Army. The supporting system includes questionnaire survey data collection; automated processing, storage and retrieval of collected data; analysis of the data; and distribution of military occupational data (MOD) reports and analytical findings.

The questionnaires for the following aviation MOSs are now in the field:

- 67 Aircraft Maintenance
- 68 Aircraft Components Repair
- 93D Flight Simulator Specialist
- 93H ATC Tower Operator
- 93J ATC Ground Control Approach Specialist
- 93K ATC Approach Control En Route Specialist
- 93L Air Traffic Control Chief

The data bank is a major source of information for use in the analysis of military occupations (AR 611-3, 25 June 1973). MODB is a management instrument developed to support MOS development, job evaluation and determination of qualitative training requirements. It also impacts directly upon determination of qualitative personnel requirements, force structure requirements, doctrine, materiel and effective assignment and use of personnel. An interservice exchange of information has further expanded the usefulness of the data bank. It is based on actual field data describing tasks performed, equipment used or maintained and special requirements which soldiers must meet throughout the world to perform their duties. The MOD reports are produced in a variety of formats to support the data analysis efforts of the MODB staff and to meet other users' requirements for occupational data. The initial survey covering more than 390 enlisted MOSs was accomplished from 1967 through the spring of 1971. Upon completion of the initial survey (Survey I), the Continental Army Command, along with Department of the Army staff agencies, selected 150 enlisted MOSs to be included in a second survey (Survey II) which was completed in September 1973. Survey III which covers approximately 170 enlisted MOSs is currently in progress and will run through mid-1974. MODB surveys will continue annually so that all enlisted MOSs are reviewed and analyzed approximately every 2 or 3 years. Survey IV, which is to begin in mid-1974, is now in the final planning stage. Work has not begun on the commissioned and warrant officer MOS.

The item lists for each three-character enlisted MOS include:

- TASKS which may be performed by those working in the military occupational specialty being surveyed.
- EQUIPMENT which may be used, maintained or both used and maintained.
- SPECIAL REQUIREMENTS which may be required of those working in the MOS.

In addition, space is provided for the respondents' comments on their schooling, current job and on the MODB questionnaire. The write-in comments are used to identify special problem areas for analysis, to assist in the review of MOS specifications and requirements, to aid in the design and modification of training programs and to further improve the questionnaires. The MODB staff has found the write-in page to be a valuable source of information, thus it is as carefully reviewed as the objective questionnaire data.

The Army service schools submit questionnaire item lists to the Military Occupational Research Division (MORD) for initial review and processing. These school lists constitute the heart of the questionnaires. The MORD reviews the item lists to ensure that they reflect the job description as shown in AR 611-201 and that all enlisted pay grades, duty positions and skill levels of a particular MOS are covered. Additional questionnaire items are inserted by MORD to supplement service school sub-

missions for those areas not covered by doctrine or training. Any special job requirements, job satisfaction indicators or other background information which may assist the analyst to establish the job's requirements and the incumbent's opinions and characteristics are added at this stage.

Following the initial review the questionnaire submissions are coordinated with other DA staff agencies, including the Military Occupational Specialty Division (MOSD) and the Enlisted Evaluation Center (EEC). This step provides MORD with a professional check on the technical and operational adequacy of the content and language in the questionnaire. When significant changes are made during review and coordination phases, MORD coordinates with the service school action officer who prepared the original item lists.

MORD edits the approved item lists for correct format, clarity, concise wording and completeness, and then assigns a seven-digit numeric code to each item in the questionnaire to allow for efficient computer processing and retrieval.

Approximately 2 weeks prior to shipment of the questionnaires to data collection agencies (major Army commands and the numerous continental United States installations and activities) transmittal letters are sent informing these agencies of the number of questionnaires they will receive. Along with the letter the research division sends a by-name listing of personnel within a particular command who are qualified, according to the enlisted master file, to take a specific MOS questionnaire. This list is designed to assist project officers in finding qualified incumbents. However, the project officers are the final judges as to the qualifications of an incumbent. They must decide whether or not a person meets the requirements listed in paragraph 2-6, AR 611-3, and they must find qualified replacements for personnel on the by-name list who are found not to be qualified. The single most important criterion for selection to complete the questionnaire is assignment to the appropriate duty MOS position.

In accordance with the MODB data collection plan, the questionnaires are completed by the individual within 75 days of receipt by the major Army command. The key document needed by the project officer and the questionnaire administrator is DA Pamphlet 611-3. Using this pamphlet the administrator supervises completion of the questionnaires by qualified incumbents. Upon completion the questionnaires may be returned to MORD by registered mail. The completed questionnaires may be returned directly to the research division by the local project officer or the questionnaires may be consolidated at the major command level and then returned to MORD, which receives and accounts for completed questionnaires as they are returned from the field. The questionnaires are screened for completeness and accuracy, the job evaluation page and the item write-in page are pulled and the questionnaires are sent to be optically scanned. The rejected questionnaires, those returned blank or completed by unqualified personnel, are retained for a short period to determine if a trend is developing in a particular command or activity.

The standard MOD reports are normally produced as soon as sufficient data for an MOS is processed into the data bank; then reports are distributed to major users. Special one-time reports are produced upon request and are tailored to meet the user's needs. For example, reports may be produced by duty position, skill level or any other factor listed in the background information section of the questionnaires. Requests for special reports are analyzed and the reports are prepared in the format best suited to present the desired data. Special reports such as this are forwarded directly to the requesting agency. Requests for MOD reports may be submitted to:

Commander, MILPERCEN
ATTN: DAPC-PMR-Q
2461 Eisenhower Avenue
Alexandria, VA 22331

in accordance with AR 611-3.

Recently a new dimension was added to the Military Occupational Data Bank; that is, the research division now has the capability to analyze the results of each survey. Previously, reports were produced and sent to Army service schools, EEC, MOSD and other agencies without comment or interpretation. Now the data and the comments on the write-in pages are analyzed and the trends and significant findings are summarized. These findings along with the reports are sent to the interested agencies for information and action. The data analysis capability should give the research division a greater voice in bringing about improvements in training, MOS specifications and requirements, MOS testing and other areas that impact on the soldier, his performance and his job satisfaction.

Additional information pertaining to the MODB system may be obtained by consulting DA Pamphlet 611-3 and AR 611-3; by writing MILPERCEN, ATTN: DAPC-PMR, 2461 Eisenhower Avenue, Alexandria, VA 22331; or by phoning—

Chief, Military Occupational Research Div 325-9267 (AUTOVON 221-9267) (DAPC-PMR)
Chief, Inventory Development & Data Analysis Br 325-9268 (AUTOVON 221-9268) (DAPC-PMR-Q)
Chief, Inventory Development & Data Analysis Br 325-9270 (AUTOVON 221-9270) (DAPC-PMR-O)

Instrument Meteorological Conditions

IMC

"He is a fool who thinks by force or skill
To turn the current of Nature's will."

SINCE ITS BEGINNING, Army aviation has been plagued with accidents in which adverse weather conditions prevailed. Yet, much time, effort and money are spent studying atmospheric conditions and providing sound and frequently updated weather forecasts for safe flight. As a whole, these forecasts are reliable, except for an occasional monkey wrench Ole Mother Nature sometimes throws into the works.

Despite the weather information available for flight planning, some aviators still try to buck Ole Mother Nature. Unfortunately, some never get a second chance to test her powers. It's time we realize that weather-related accidents aren't usually the kind we can walk away from. During a recent 12-month period, Army aircraft were involved in 155 weather-related mishaps. These resulted in 133 fatalities in addition to the number of aircraft destroyed and damaged. Cause factors included overconfidence; lack of self-discipline, command supervision, and experience; poor pilot judgment; and violation of regulations, which are evident in the following accident briefs.

• An OH-58A pilot was on a VFR (Visual Flight Rules) service mission to transport a passenger from one point to another. At the time of departure from home base, weather conditions were above minimums with scattered rainshowers. During the return flight, weather conditions were acceptable at the point of departure; however, conditions en route were forecast as marginal. Twenty-two miles from the departure point, the pilot contacted radar control and said he was having problems with the ADF (Automatic Direction Finder) and that he needed a vector to his home base. He also reported that he was running into large patches of thick fog and was going to descend below the fog. This was the last communication between radar control and the pilot. He continued to try to remain VFR after encountering adverse weather, and the helicopter crashed into trees. The pilot and passenger were killed.

• An OH-58A pilot was on a service mission to transport a passenger and return solo to home base. At the time of departure, weather conditions were forecast to be 500-foot ceiling with 10 miles visibility. The flight to destination was uneventful. On the return flight, the aircraft crashed on a mountain ridge and burned, and the pilot was killed. Weather conditions in the vicinity of the accident were 500 to 600 feet overcast with 4 to 7 miles visibility. During the investigation, evidence indicated that the pilot attempted to descend through a break in the overcast, exceeded his limitations and crashed at a high rate of vertical velocity. He filed a VFR flight plan to an airfield without a control zone, which, at the estimated time of arrival, was forecast to be below VFR minimums, a violation of AR 95-1.

• Another OH-58A pilot was on a service flight consisting of three missions to pick up and deliver passengers. After he had completed the first mission, his flight plan was changed because weather conditions at the pickup point were below VFR minimums, and a new weather briefing was not received. During the third part of the mission, the pilot picked

Patsy R. Thompson
Directorate for Education and Prevention

ABOVE: Pilot of this OH-58A tried to remain VFR after encountering large patches of heavy fog

LEFT: Wreckage of OH-58A after pilot exceeded his limitations by attempting to descend through overcast

up two passengers, took off and notified control that visibility was 1 mile. Ten minutes later, the pilot went IMC (Instrument Meteorological Conditions) and at the same time transmitted a Mayday call to control. The aircraft crashed and burned, killing the pilot and both passengers. This pilot took off in marginal weather and used poor judgment in continuing flight after encountering weather conditions that dictated IFR (Instrument Flight Rules). He was using a highway as a means of navigation, but when he left the highway, he entered the clouds and became disoriented.

• The copilot of a UH-1H filed a VFR flight plan for a routine service mission and received a weather briefing by telephone. Some thunderstorms and a tornado watch were in effect at the crew's destination point. The crewmen proceeded as planned until they approached an area approximately 5 miles northwest

of their destination. It was dark by now, yet they continued into heavy precipitation and high winds, accompanied by almost continual cloud-to-cloud and cloud-to-ground lightning. They failed to exercise good judgment and displayed a lack of flight discipline by continuing flight into deteriorating weather conditions. The helicopter crashed, killing both crewmembers and the passenger. Supervisory error was also a factor in this accident. The aviation section commander (the passenger) failed to direct the flight crew to divert the aircraft to another airfield while they were still under VFR conditions. It is suspected that get-home-itis and overconfidence were the major factors influencing this decision.

These accidents could have been prevented had the pilots used good common sense. In each of these accidents, the aviators were flying VFR in known marginal conditions or continued flying into unmarginal weather. Particularly noteworthy is that three of the accidents occurred in the OH-58A which presently is not designed or equipped for IFR flight. Any time an aircraft is not certified for instrument flight or an aviator is not instrument rated, flight into weather must be avoided like the plague. Aviators who do hold instrument ratings must maintain a high proficiency level of IFR flying by flying instruments regularly and through constant reference to AR 95-1, the Airman's Information Manuals, DOD FLIPs and the Federal Aviation Regulations. An aviator who fails to maintain his instrument flight proficiency can be just as susceptible to a weather accident as a noninstrument-rated aviator.

It is clear that weather has no respect for experience or ratings, or sympathy for the inexperienced and unqualified. Those who venture into it and commit the errors of (1) trying to get through or under its most severe forms; (2) trying to fly contact in instrument weather; or (3) trying to fly instruments without training and qualification must be prepared to pay the high price weather demands.

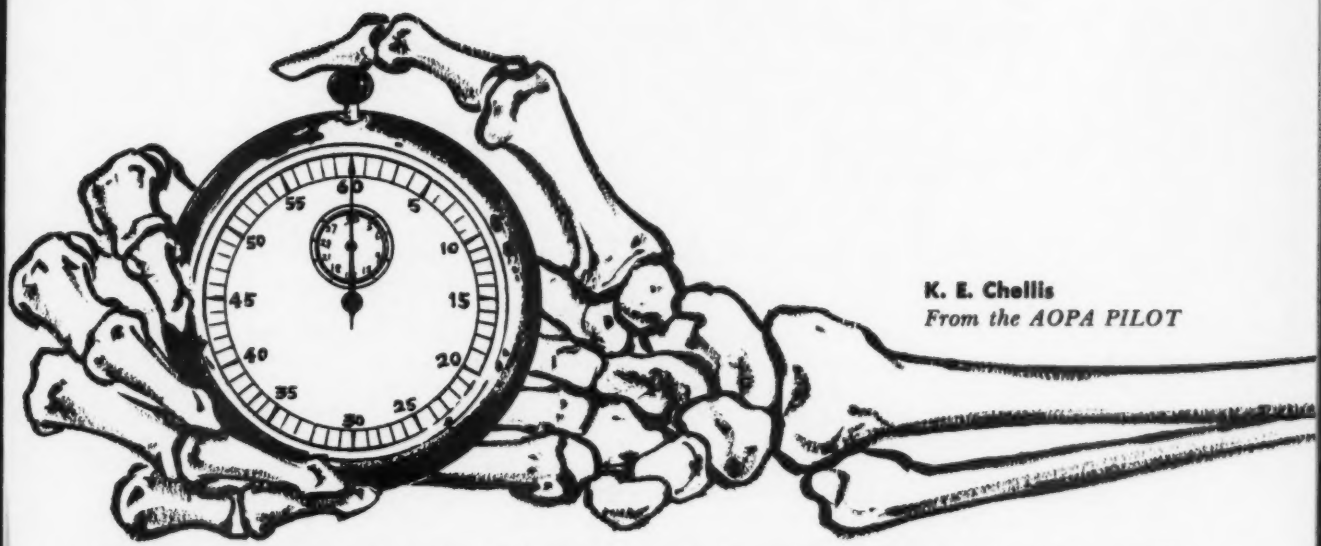
Some who survive weather accidents use the term "inadvertent" to describe how and why they flew into weather hazards without adequate preparation or qualification. If *you* accept this explanation, the word will make *you* an excellent epitaph.

If you are tempted to take off in marginal weather without instrument training, read this article first. If you decide to go anyway and lose visual contact, start counting down from 178 seconds.

178 SECONDS!

HOW LONG can a pilot who does not have instrument training expect to live after he flies into bad weather and loses visual contact with the ground? The Institute of Aviation of the University of Illinois sought to answer this question when it was developing a curriculum for the AOPA [Airplane Owners Pilots' Association] 180° Rating, a system designed to enable nonprofessional pilots to fly out of bad weather, under a grant from the AOPA Foundation, Incorporated. Twenty student-subjects were allowed to fly into simulated instrument weather. All of these "guinea pigs" went into graveyard spirals or roller-coasters. The tests differed in only one respect: the time required for the different subjects to lose control of their planes. This interval ranged from a maximum of 480 seconds to a minimum of 20 seconds. "The average time was 178 seconds—2 seconds short of 3 minutes," the Institute said in its report of the experiment. K. E. Chellis of Tallahassee, FL, forcefully tells what those 178 seconds mean to the pilot. Author Chellis is a flight instructor and a certificated 180° Rating instructor.—The AOPA Pilot

The sky is overcast and the visibility poor. In fact, that 5-mile reported visibility looks more like 2 now.



K. E. Chellis
From the AOPA PILOT

You are no longer able to judge the height of the overcast. Your altimeter says you are at 1,500 feet and your map tells you that there is terrain up to 1,200 feet beneath you. There might even be a tower around here some place, for you are not exactly sure just how far off course you are. But you've flown in worse weather than this, so you go on.

You unconsciously ease back on the wheel just a bit, to clear those not too imaginary towers. Then with no warning you are in it. You stare so hard into the milky white mist that your eyes hurt, but you see nothing. You fight the feeling that is in your stomach, and swallow, only to find your mouth dry. Now you know you should have waited for better weather. The appointment was important but not that important. Somewhere a voice is saying, "You've had it—you've had it!"

You now have one hundred seventy-eight seconds to live. Your airplane is still on an even keel but your compass is turning slowly. You push a little rudder and add a little pressure on the wheel to stop the turn, but this feels unnatural and you return the controls to their original position. This feels better, but now your compass is turning a little faster and your airspeed is increasing slightly. You scan your instrument panel for help but now it looks almost unfamiliar. You are sure you will break through in several minutes. This is just a bad spot. But you don't have several minutes left.

You have one hundred seconds to live. You glance at your altimeter and are shocked to see it unwinding. You already are down to 1,200 feet and instinctively you pull back on the wheel. But the altimeter still unwinds, the engine is revving too fast and the airspeed is almost to the red line.

You have forty-five seconds to live. Now you are sweating and shaking. There must be something wrong with the controls, for pulling back on the wheel only moves the airspeed indicator a little farther into the red. You can hear the wind tearing at the airplane.

You have ten seconds to live. Suddenly you break out of the overcast. There is the ground. You can see the trees rushing up at you, and you can see the horizon if you turn your head far enough. It's at an unusual angle; you are almost inverted. You open your mouth to scream—but you are too late.

You have no seconds to live. It's all over, son.

Ted Kontos
Directorate for Education and Prevention

USAAAVS

There are procedures we can follow which leave little or no excuse for running

OUT OF GAS

WOULD YOU ENJOY flying daily with an airline known to average one fuel exhaustion mishap approximately every nine days? Not likely. Yet, this is precisely the record we established in Army aviation during a 28-month period from 1 January 1970 through 30 April 1972 when Army aviators made 20 precautionary landings and 34 forced landings, and had 10 incidents and 32 accidents from this cause. These 96 mishaps resulted in three fatalities, 23 injuries and damage costs that exceeded $6½ million. Not a pretty picture.

While more thorough flight planning and better fuel management would have eliminated the need for some of the precautionary landings, all were definitely in order and represent correct actions that prevented in-flight emergencies and mishaps of a more serious nature. But even if we discount the 20 precautionary landings, some of which were caused by faulty fuel gauges, what about the other 76 mishaps? Most could have been prevented. One possible exception involved a pilot in the Republic of Vietnam on a combat support mission that required him to remain airborne for an extended period. Fuel exhaustion occurred en route to a secure area. The following briefs are typical of the remaining mishaps:

UH-1—Engine failed at night and IP autorotated aircraft to wooded area. Aircraft sustained major damage. Neither IP nor student pilot checked fuel gauge after noting it read 1,000 pounds. (It indicated 42 pounds at crash site.) IP did not know takeoff time and neither occupant noted warning light. Light came on when checked at crash site and functioned properly during refueling check.

UH-1—Warning light came on but fuel quantity gauge showed ample fuel remaining. Crew continued flight until fuel exhaustion occurred. Major damage. Gauge was inaccurate. Crew failed to perform through-flight checks.

UH-1—Pilot extended flight and exhausted fuel supply. Gauge gave erroneous indication of fuel remaining, but warning light was on for approximately 15 minutes before engine failed.

CH-47—Low-level warning light came on during flight to deliver sling load. Pilot opened cross feed valve and continued flight. After delivering cargo, pilot headed for refueling area. Aircraft was number two for landing but pilot did not inform tower of low fuel state. Both engines failed on final at approximately 500 feet and 50 knots. Pilot autorotated aircraft, landing hard approximately 150 meters short of runway. Main rotor blades flexed and struck fuselage, causing major damage.

U-21—Pilot extended flight beyond fuel range, exhausting fuel supply. Major damage. Gauges were inaccurate, and warning lights did not illuminate because of corrosion on terminals. Pilots did not perform through-flight checks and were not thoroughly familiar with fuel system.

OV-1—Fuel gauges indicated 100 pounds fuel remaining. Engines flamed out approximately 6 minutes later. Pilot and observer ejected.

Numerous other aircraft were involved in fuel exhaustion mishaps when flight was continued after warning lights illuminated. In one instance, the pilot made a precautionary landing. A mechanic then checked both the indicator and warning systems, determining the gauge was correct. Flight was resumed. Shortly afterward, fuel exhaustion occurred. The warning light system was functioning properly, and the gauge was in error.

While both rotary wing (RW) and fixed wing

(FW) aircraft were involved in these mishaps, RW aircraft, which logged approximately six times as many flight hours as FW during this reporting period, were involved in eight times as many mishaps. However, dollar losses for FW aircraft totaled more than 3½ million, exceeding those for RW.

Predominant cause factors were inadequate flight planning; failure to conduct through-flight checks; failure to heed warning lights and fuel quantity indications, particularly when the two did not correspond; and continuing flight when a low fuel state was known to exist. Ironically, fuel exhaustion often occurred when aircraft were within one mile of their destination points.

Contributing cause factors included inadequate supervision, lack of training of both flight and maintenance personnel, and erratic operation of fuel quantity and warning light systems.

Although speculative in nature, two additional areas warrant examination. The first concerns RW pilots who are involved in these types of mishaps at a disproportionately higher rate than are FW pilots. Could the helicopter's capability of landing in virtually any clearing give the pilot a false sense of security, enticing him to take chances he would not take if he were piloting a FW aircraft? Evidence suggests that it does. One pilot who was to reposition a helicopter noted the fuel quantity gauge indicated near empty and that the warning light was on before he started the engine. Nevertheless, he proceeded to take off. Fuel exhaustion occurred and a mishap resulted. Suppose this pilot was to have transported a FW aircraft to a neighboring airfield 2 miles distant. Would he have taken off with the same fuel quantity and low-level indications? Not likely.

The second area concerns those pilots who continue flight when they know their fuel supply is depleted. One guilty pilot who ran out of fuel on final made this comment: ". . . The 20-minute warning light had been on for *only* 18 minutes. . . ." AR 95-1 requires the pilot to plan a VFR flight so that he will have a 30-minute minimum fuel reserve on reaching his destination. Obviously, it can be embarrassing to have to make a precautionary landing because of a low fuel state. Yet, pilots who succumb to the temptation to continue flight with a low fuel supply nullify the safety factor intended by AR 95-1 and increase the possibility of mishaps. Although we don't know how prevalent this practice is, we do know that some routine flights are being completed with warning lights illuminated.

One example that illustrates the real purpose of AR 95-1 concerns a FW pilot who was diverted twice during a ferry flight because of deteriorating weather, including heavy fog that had not been forecast. When he finally arrived over the airfield, he was operating off his reserve supply. After two missed approaches, he landed the aircraft safely. Fuel remaining was estimated sufficient for approximately 5-6 more minutes of flight. Enough said.

While research is now being conducted to improve fuel quantity and warning systems for use on future aircraft, a study of those presently in use shows them to be adequate when properly inspected and maintained. And while a pilot cannot rely solely upon them, neither can be depend solely on his own computations. For example, we have had numerous instances of fuel siphoning in flight. In such cases, a pilot's calculations might show that ample fuel remains while the gauges may correctly indicate otherwise. For maximum safety, an interdependence between pilot, gauge and warning light is necessary. Following are a few simple recommendations which can effectively prevent fuel exhaustion mishaps.

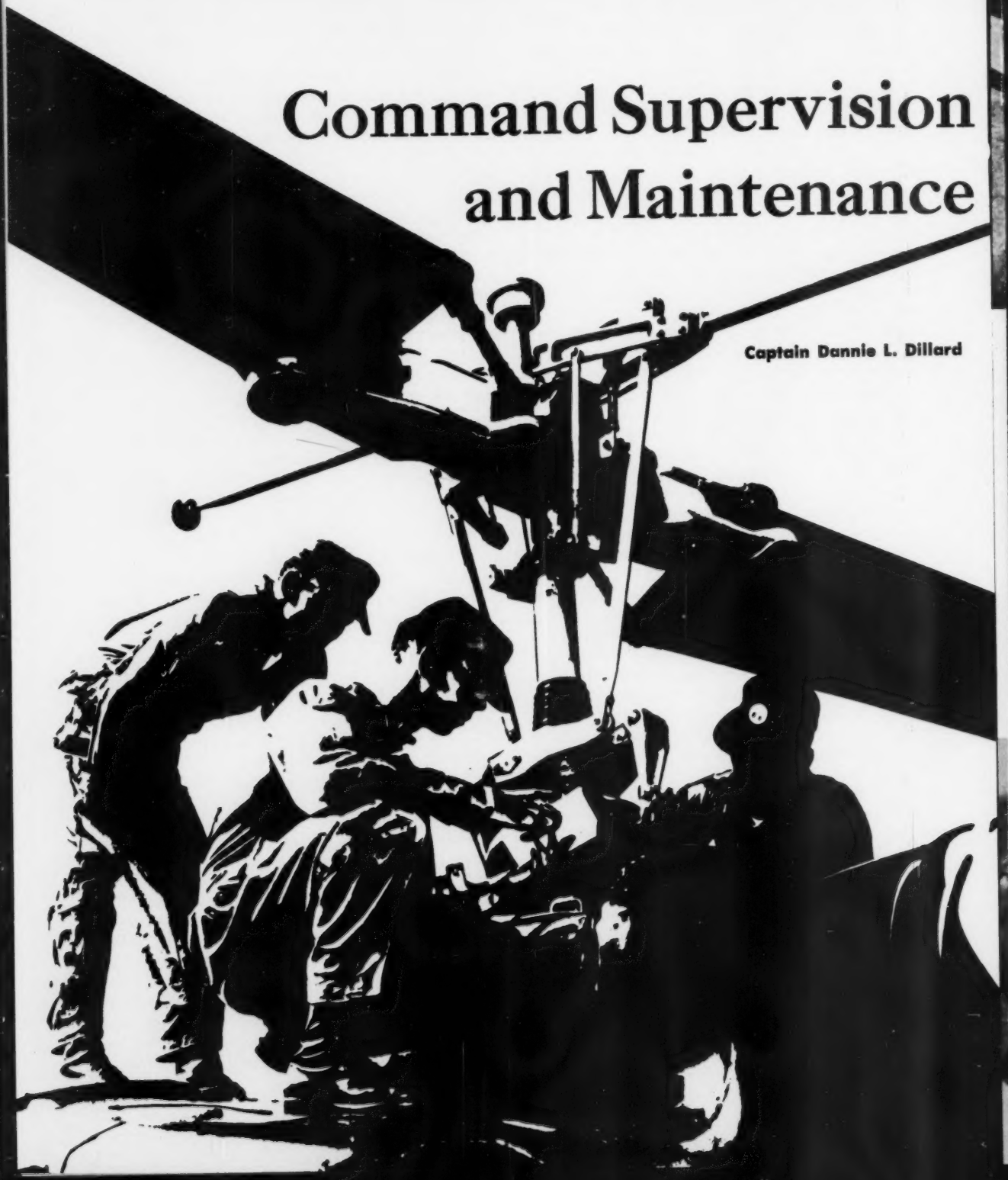
- Ensure that both flight and maintenance crews are thoroughly familiar with the fuel system aboard their aircraft, and provide any training deemed necessary.
- Ensure that the fuel quantity and warning systems are properly maintained.
- Perform thorough flight planning. Compute fuel needed, including reserve, and ensure an adequate amount is on board.
- Properly manage fuel and perform cross checks during flight.
- Always take the safest course of action. If the gauge indicates ample fuel but the warning light illuminates, assume the warning light to be correct. Similarly, if the gauge shows a low fuel state while calculations indicate ample fuel, assume the gauge to be correct. Avoid taking unnecessary risks. When in doubt, make a precautionary landing.

Granted, there are always exceptions. What if an aircraft is being operated in a hot, humid climate, hauling heavy loads that don't permit carrying full fuel, particularly on an aircraft modified for rapid pressure refueling? Since we have no visible means of determining the amount of fuel aboard and since we can't depend on the gauge, what can we do? In a critical situation such as this, we can drain the fuel, then service the aircraft with the exact amount we want. Further, we can check the accuracy of the fuel quantity and warning systems in the process. Troublesome? Yes, but the point is that there are procedures we can follow to ensure safe flying, leaving little or no excuse for running out of fuel.

Fuel exhaustion mishaps, like smallpox, should be relegated to the past. And they will be. But only after we determine to do our respective jobs the way we are supposed to—BY-THE-BOOK!

Command Supervision and Maintenance

Captain Dannie L. Dillard



SOMETIMES IN ASSESSING the capabilities of a military unit, I am sure that individuals much wiser than myself have theorized that poor discipline or poor maintenance eliminates a unit commander's chances of victory before he reaches the battlefield. If you evaluate this statement, I think you will tend to agree. Both problem areas could be related. Certainly, each requires command supervision. From the logistician's point of view, let's consider the unit commander in his role as a maintenance manager. His efforts to establish a sound operational maintenance program will directly influence his unit's combat readiness.

First, let's begin with the basics of the unit maintenance system—the first echelon or operator and crewchief duties. This is where it starts. If you cannot get off the ground, why worry about the flight? The vehicle operator or crewchief must be able to inspect and maintain his vehicle according to the procedures outlined in the appropriate operator's manual. Preventive maintenance checklists are published to provide information on trouble areas that may be encountered, thus allowing the operator to schedule maintenance to prevent or control potential problems. When a maintenance or repair problem is anticipated, the operator merely submits a parts requisition or a maintenance request, as necessary. If this basic step in the system is followed and closely monitored by the operator's supervisor, a vehicle will spend less time in a deadlined status waiting for a needed part or for work to be completed at a higher echelon. In some cases, the vehicle may never be deadlined for lack of parts.

As in all military operations, the chain of command must be used to issue and receive instructions. Command supervision is the key to a successful unit maintenance system. This important second step is necessary to ensure effective distribution of the workload and adherence to the proper procedures at the ground-floor level. An individual tends to procrastinate or become downright lazy at times. For these reasons it becomes necessary to occasionally use the old "prod."

Normally, this responsibility falls upon the operator's immediate supervisors—the platoon leader and the platoon sergeant. As first-line supervisors, they must ensure that the operator or crewchief is carrying out his duties as the commander has directed. But supervising the actual wrench-turning operation is not their only responsibility. They must constantly check the entries in the vehicle logbooks for clarity and accuracy. Most units rely on The Army Maintenance Management System (TAMMS) clerk for this essential job. However, he has enough to do without having to worry about additional work.

Spread the work around! It's not a one-man show by any means. Demand that everyone be proficient and knowledgeable. Commanders must use the chain of command and make it work for them. A platoon leader's and platoon sergeant's job description should make them responsible for checking all entries on the maintenance forms and records for legibility and accuracy. Once they have done this, they can direct their attention to the entries themselves.

Have all modification work orders been entered and accomplished? Why not? Has the operator completed a daily DA Form 2404, Equipment Inspection and Daily Worksheet? Most important, are the requisitions that appear on the DA Form 2408-1, Equipment Monthly or Daily Log, current? Do they have a document register number? Are all requisitions entered on DA Form 2408-14, Uncorrected Fault Record? These are but a few of the details with which supervisors must be concerned. Each solution must be tailored to fit the particular situation.

Moving up the ladder, the motor officer and the motor sergeant, in addition to supervising the wrench-

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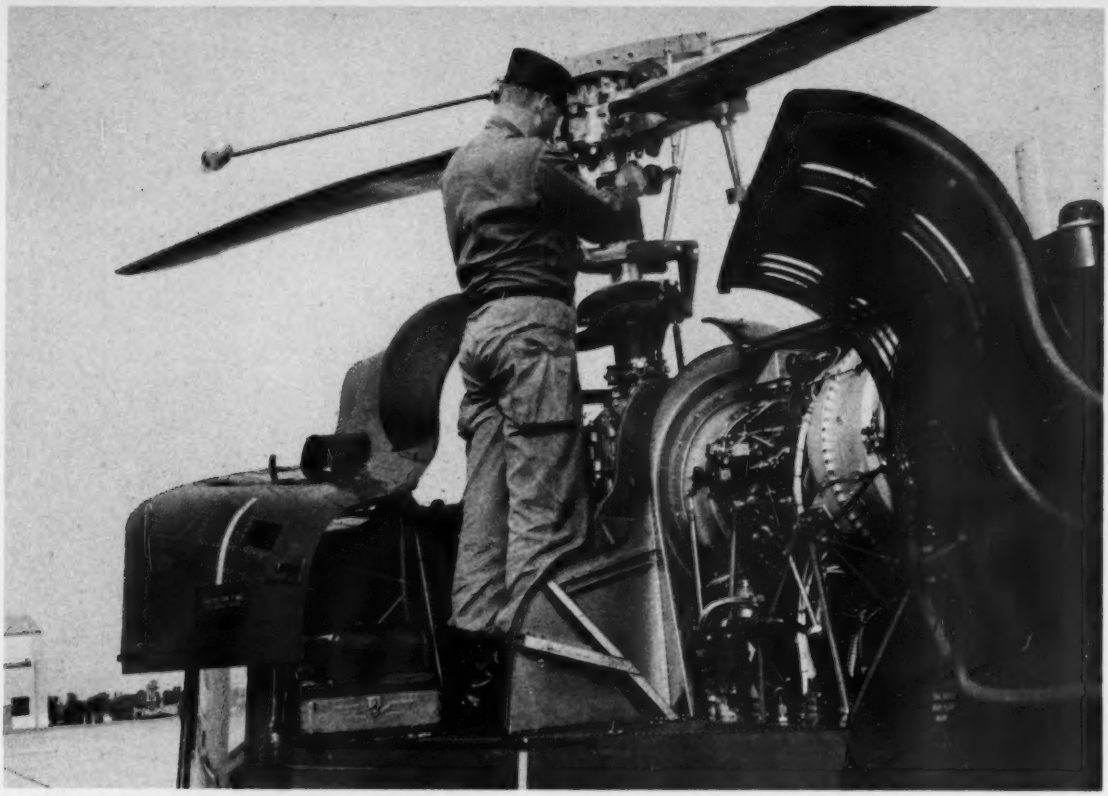
Captain Dillard, a rotary wing aviator, is assigned to Headquarters, 1st Aviation Company, 1st Infantry Division, Fort Riley, KS. He has served oversea tours in Vietnam and Korea. He is a graduate of the Infantry Officer's Basic Course, Fort Benning, GA.



A sound organizational maintenance program includes knowledgeable NCOs with assigned responsibilities

turning, have much to contribute. Their experience and technical knowledge should be put to good use in directing the operation of the system, including such details as seeing that the mechanics use the appropriate manual designed for the specific job and that maintenance personnel do not take unauthorized or dangerous short cuts.

Each maintenance section must have a school-trained clerk or an exceptional on-the-job trained TAMMS clerk. This key position can be compared to that of a battalion operations officer. The TAMMS clerk is the center of operations for the maintenance section. He must maintain the necessary forms and records required to effectively operate the maintenance section. His position is important and his work should be closely monitored for clarity as well as accuracy by the motor officer and motor sergeant. Maybe you cannot drive the forms, but you cannot drive very long without them.

One would think with all this supervision, additional control would cloud the issue. Not so. Remember human nature? The tendency still exists for an individual to be lazy and procastinate. Someone must keep the system moving and ensure compliance in all areas. The unit commander must constantly evaluate his program to identify recurring problems, provide solutions to them, and implement newer, sounder methods. The commander must stay abreast of the situation to provide guidance where needed and he must be able to spot-check and troubleshoot the system to maintain a steady workflow—with emphasis on "spot-check and troubleshoot."

A commander must be able to decipher the system maintenance indicators, to identify a trouble spot or anticipate a potential problem, and to formulate a solution. After all, he is the one who sinks if the system does. In accomplishing an assigned mission, he is the individual most concerned with moving, shooting and communicating.

There may be fallacies in the system described, but keep in mind, these recommendations provide a starting point to build on. The system is flexible enough to meet the situation and basically sound in concept. It is working for many commanders and is offered here only as a suggestion or to serve as a possible reminder. Although command supervision is required for any maintenance program, oversupervision detracts from its effectiveness. Care must be taken to ensure that each individual in the system is allowed to accept his own responsibilities and use his own imagination to cope with problems at his level.

Involvement and acceptance of responsibilities at each level in the chain of command forestalls the possibility of a weak link. This, in turn, strengthens the unit operational maintenance system, indicates effective maintenance management and upgrades the unit's combat readiness.

Amber Lens on UH-1H Landing Lights

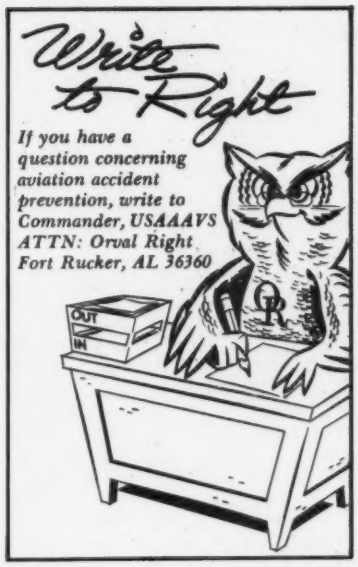
I am currently flying in the UH-1H. About seven weeks ago my ex-company commander thought of an idea that was supposed to help in night combat assaults against the enemy. He gave his idea to the battalion commander who, I guess, agreed with him wholeheartedly because he put out that this device would not be removed from the landing lights of the aircraft unless he said otherwise. He gave this as a VOCO (verbal orders, commanding officer).

The device I am talking about is a circular disc the diameter of the landing light which is amber or yellow-orange in color. It is mounted by the three mounting screws of the landing light mount ring. The lens extends from the original light about one-half to three-fourths inch.

When illuminated, this light is direct and does not have the flare off to the sides of the beam that is necessary to clear the aircraft at night from obstacles. This light is direct and has a very high intensity of heat that could ignite the foliage in a matter of seconds. Also, the heat inside the landing light itself is in excess of 200 degrees and that is very dangerous because of the mounting position of the landing light just forward of the fuel sumps. Another bad thing is that it will warp considerably.

I would like some advice on this matter because there has been no verification from the Department of the Army.—Flight crew engineer

Aircraft modifications are authorized by publication of a DA Modification Work Order (MWO), or by appropriate instructions in Depot Maintenance Work Requirements (DMWR) and contractor work statements. Modifications can not be made prior to the issuance of the modification authorization document. Proposed modifications are subject to appropriate testing in accordance with AR 700-35 prior to consideration by the approving agency. Additional information concerning aircraft modification is contained in AR 750-1, chapter 3-1.


Write to Right
If you have a question concerning aviation accident prevention, write to Commander, USAAAVS ATTN: Orval Right Fort Rucker, AL 36360
OUT
IN

Accident Prevention SOP

I have just been appointed to the Pennsylvania Army National Guard and have been assigned as the battalion aviation safety officer. As would seem appropriate, my first task is to devise and/or revise an accident prevention SOP. Could you give me some materials and references to accomplish this task?—ASO

A USAAAVS pamphlet entitled "Commanders' Aviation Accident Prevention Plan" will help you and your commander in devising an aviation accident prevention program compatible with the mission and functions of your unit. Publications for a safety program are listed on page 13 of the pamphlet and are recommended for your unit safety reference library. Good luck with your safety program.

Use of Helmets During MOC

When performing a maintenance operational check (MOC) on an aircraft, should the pilot and crew chief have their helmets and gloves on during the start and runup? My maintenance officer says they should have their helmets off to listen for unusual noises, but it seems to me that, unless they are listening for something specific, they should have their helmets on and visors down, particularly when working around an operating engine. Your comments would be appreciated.—Aviator

There is no written guidance specifically covering use of helmets during an MOC. However, helicopter checklists, which are required to be used by paragraph 3-16 of AR 95-1, call for the helmet to be put on after the battery switch is turned on. Therefore, the minimum crew as specified in the operators manual should be strapped in, sleeves down, with gloves and helmet on when starting the aircraft. This ensures that the crew is as prepared as possible to fly the aircraft should it inadvertently become airborne. Other maintenance personnel can be used to listen for unusual noises during the start and runup.

Additionally, the pilot of the aircraft should be in contact with those personnel working around the engine/transmission area. If a cord is not available to allow contact through the intercom, then one man should be stationed to maintain visual contact with both the pilot and the maintenance personnel. This man can relay information through prearranged hand and arm signals should an emergency occur.

APPROVED FUELS

SOURCE	PRIMARY OR STANDARD FUEL (1)	ALTERNATE FUEL (2)	
U.S. MILITARY FUEL	JP-4 (MIL-T-5624)	JP-5 (MIL-T-5624)	
NATO CODE NO.	F-40 (WIDE CUT TYPE)	F-44 (HIGH FLASH TYPE)	
COMMERCIAL FUEL (ASTM-D-1655)	JET B	JET A	JET A-1/NATO F-34
AMERICAN OIL CO.	AMERICAN JP-4	AMERICAN TYPE A	
ATLANTIC RICHFIELD	ARCOJET B	ARCOJET A	ARCOJET A-1
RICHFIELD DIV		RICHFIELD A	RICHFIELD A-1
B.P. TRADING	B.P.A.T.G.		B.P.A.T.K.
CALTEX PERTOLEUM CORP.	CALTEX JET B		CALTEX JET A-1
CITIES SERVICE CO.		CITGO A	
CONTINENTAL OIL CO.	CONOCO JP-4	CONOCO JET-50	CONOCO JET-60
GULF OIL	GULF JET B	GULF JET A	GULF JET A-1
EXXON CO, USA	EXXON TURBO FUEL B	EXXON A	EXXON A-1
MOBIL OIL	MOBIL JET B	MOBIL JET A	MOBIL JET A-1
PHILLIPS PETROLEUM	PHILJET JP-4	PHILJET A-50	
SHELL OIL	AEROSHELL JP-4	AEROSHELL 640	AEROSHELL 650
SINCLAIR		SUPERJET A	SUPERJET A-1
STANDARD OIL CO.		JET A KEROSINE	JET A-1 KEROSINE
CHEVRON	CHEVRON B	CHEVRON A-50	CHEVRON A-1
TEXACO	TEXACO AVJET B	AVJET A	AVJET A-1
UNION OIL	UNION JP-4	76 TURBINE FUEL	
FOREIGN FUEL	NATO F-40	NATO F-44	
BELGIUM	BA-PF-2B		
CANADA	3GP-22F	3-6P-24e	
DENMARK	JP-4 MIL-T-5624		
FRANCE	AIR 3407A		
GERMANY (WEST)	VTL-9130-006	UTL-9130-007/UTL 9130-010	
GREECE	JP-4 MIL-T-5624		
ITALY	AA-M-C-1421	AMC-143	
NETHERLANDS	JP-4 MIL-T-5624	D. ENG RD 2493	
NORWAY	JP-4 MIL-T-5624		
PORTUGAL	JP-4 MIL-T-5624		
TURKEY	JP-4 MIL-T-5624		
UNITED KINGDOM (BRITAIN)	D. ENG RD 2454	D. ENG RD 2498	

NOTE

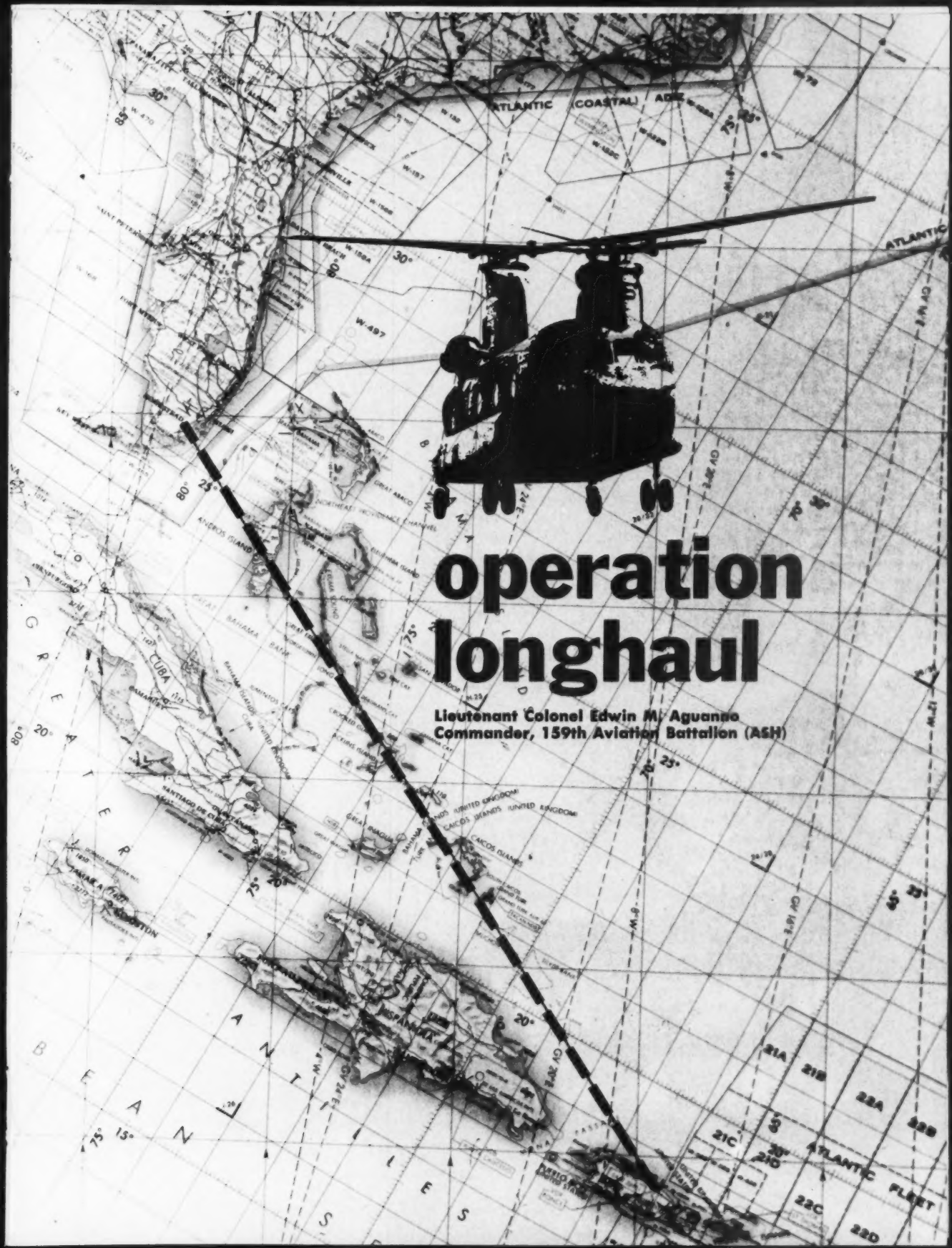
Anti-icing and Biocidal Additive for Commercial Turbine Engine Fuel—The fuel system icing inhibitor shall conform to MIL-I-27686. The additive provides anti-icing protection and also functions as a biocide to kill microbial growths in aircraft fuel systems. Icing inhibitor conforming to MIL-I-27686 shall be added to commercial fuel, not containing an icing inhibitor, during refueling operations regardless of ambient temperatures. Refueling operations shall be accomplished in accordance with accepted commercial procedures.

What if JP-4 is Not Available?

WHAT TYPE OF FUEL should a pilot attempt to obtain and use if his turbine engine aircraft's primary fuel (JP-4) is not available? Reference should be made to the applicable dash 10 operator's manuals for priority fuel usage. The information on the chart is currently being prepared for inclusion in all dash 10 operator's manuals. (The appropriate dash 10 manuals for those aircraft with T55-L-7 series engines will incorporate their own peculiar APPROVED FUELS chart.)

This chart will replace the tables of approved fuels currently printed in dash 10 manuals. TB 55-9150-200-25 (Engine and Transmission Oils, Fuels and Additives for Army Aircraft) is also being changed to include the information on this chart. It is recommended that a copy of the chart, with note, be inserted in each log book of turbine-powered aircraft.

If the engine manufacturer recommends U.S. military JP-4 as the primary fuel and it is not available, use one of the approved commercial fuels listed under column 1, "Jet B," ahead of alternate fuels in column 2. Questions regarding chart information should be addressed to Commander, USAAVSCOM, ATTN: AMSAV-FKP, St. Louis, MO 63166.



operation longhaul

Lieutenant Colonel Edwin M. Aguanno
Commander, 159th Aviation Battalion (ASH)

operation longhaul

ARMY AVIATION has taken another giant step forward and I'm proud to have been part of this history-making event.

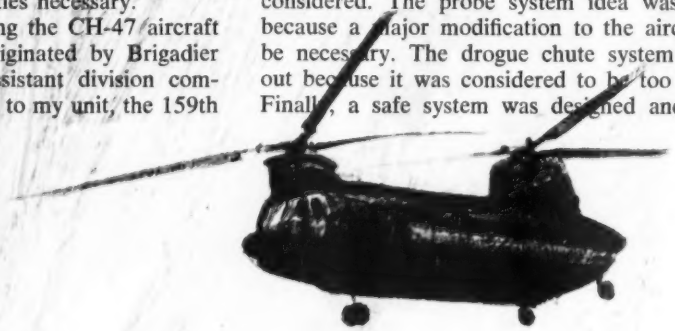
In early 1973, the 101st Airborne Division (airmobile) at Ft. Campbell, KY, was still in the process of bringing itself up to combat readiness. It was obvious that readiness for strategic deployment of the division to an overseas area would be an enormous task. One of the biggest problems facing the 101st was the transportability of our cargo aircraft—the CH-47. The Chinook is an essential part of the lead element of any of the planned deployment forces of the division.

The preferred method of transporting the CH-47 is by sea. The aircraft can be easily prepared for shipment and then made flyable upon arrival at the destination. Air Force transport is the least desirable method based on time involved in deployment, maintenance man-hours expended and cost. Strategic commitment of these two means of transportation and considerations as to security of the seaways, status of air superiority and urgency of deployment make self-deployment capabilities necessary.

The concept of self-deploying the CH-47 aircraft assigned to the 101st was originated by Brigadier General M. J. Brady, the assistant division commander. The task was assigned to my unit, the 159th Aviation Battalion (ASH). A five-phase program was established and implementation of Operation Longhaul began.

Safe mission accomplishment was our primary concern. Therefore, detailed precision planning was necessary in Phase I. A study was made of prevailing weather along different routes to various locations in the world. Support requirements were established and contacts made with the U. S. Army Aviation Systems Command (AVSCOM), U. S. Navy, U. S. Air Force, New Cumberland Army Depot and the Boeing Aircraft Company. Auxiliary fuel tanks, fuel transfer pumps, engines, oil tanks, survival gear and all other necessary equipment were procured.

One of the major difficulties was to increase the fuel capacity for long-range flight of the CH-47C. CW4 Dorse Sherrill was assigned the task of preparing the aircraft for special maintenance considerations and designing the auxiliary fuel system. A number of ways were studied. Among them was an in-flight refueling system using a probe. A drogue chute system to carry a hose into the aircraft was also considered. The probe system idea was ruled out because a major modification to the aircraft would be necessary. The drogue chute system was ruled out because it was considered to be too dangerous. Finally, a safe system was designed and later ap-



proved by AVSCOM.

The auxiliary fuel system that was certified for airworthiness consisted of four 600-gallon ferry tanks, two OV-1 Mohawk fuel transfer pumps, necessary fuel and vent lines and tiedown chains. A flight profile was established for the greatest fuel economy. The system was installed in the aircraft and tested. Prior to testing, special fuel management procedures were established.

On 2 June 1973, an aircraft equipped with the experimental fuel system was test flown by CW3 Billy W. Stafford and CW3 William L. Pepin. They took off from Campbell Army Airfield and flew 850 nautical miles nonstop to Homestead Air Force Base, FL. Two days later they refueled their Chinook and flew back to Ft. Campbell, once again nonstop. The system worked and management procedures were confirmed. What remained as a greater test was to take a flight of four CH-47s on an extended range, overwater mission from Homestead AFB to San Juan, Puerto Rico. This flight was to be Phase III.

Phase II planning was far from being complete and Phase III would not be attempted until every factor had been considered and we knew it was safe to go. We determined that the CH-47s would have to take off at a gross weight of 44,000 pounds. Through careful testing with the Boeing Aircraft Company and close coordination with AVSCOM, it was proven that the CH-47C with T55-L-7C engines could fly at 4,000 pounds over the normal 40,000-pound gross weight limit by using a limited flight profile.

Special operating limitations were established for use when the aircraft were operating above 40,000 pounds gross weight. Limitations included operating weights, air speed and altitude, sideward and rearward flight restrictions, rotor speed, takeoff and landing, and prohibited maneuvers. Aircraft were also restricted from confined-area operations. We received a safety-of-flight release from AVSCOM for the flight to San Juan.

LTC Aguanno is commander of the 159th Assault Support Helicopter Battalion stationed at Ft. Campbell, KY. He has an M.S. in Aerospace Engineering and last served in the Office of the Chief of Research and Development. There he worked on such diversified projects as the UTTAS, the YO-3A and the HLH. The 1954 USMA graduate is a Master Army Aviator with nearly 4,000 hours flight time.

OPERATION LONGHAUL

Special preparations were made for aircraft which were selected for the trip to San Juan. Each aircraft had to be capable of flying 10 hours without shutdown. Historical records were screened and the best available aircraft were selected. A maintenance inspection was conducted with special emphasis placed on lubrication requirements. Chip detectors and filter screens received special attention. Oil samples were taken and tested. Oil consumption rate was checked on all components of each aircraft and all leaks were repaired. Each aircraft was loaded to maximum gross weight, tracked and test flown for a vibration check. Each aircraft was prepared for water operations. A flyaway kit, consisting of parts frequently needing replacement, was assembled for each aircraft and survival equipment, including life rafts and individual survival gear, was carried.

Preparation of the aircraft was not the only task we faced before attempting the flight to San Juan. Crewmembers were handpicked from those available in the 159th and special training was conducted for them. All pilots-in-command and most crewmembers attended the USAF water survival school at Homestead AFB. Training was conducted for water landings, which most pilots had not done since CH-47 transition training. Special procedures were established for ditching without power, with power in calm sea and with power in rough sea. In the event an aircraft had to be ditched, I would make the decision as to which aircraft would make the water recovery.

Arrangements were made with the USAF to provide escort service and navigational assistance. They provided a C-130 equipped for rescue capabilities should the need arise.

After long months of planning and training, Operation Longhaul was ready for Phase III, the flight to San Juan. Crews had been innoculated, a thorough briefing was conducted including weather, goodbys were said and it was time to crank the engines. Aircraft were designated as the "Liftmaster Flight" with call signs of Liftmaster 4, 5, 6 and 7. The crews had named their own aircraft "San Juan Express," "Caribbean Queen," "Banana Clipper" and "Rum Boat 6." I was flight commander and climbed aboard Liftmaster 7.

We started our engines at 0800 hours on 22 September 1973 at Campbell Army Airfield and our first stop would be Homestead AFB. Our first delay occurred before we got off the ground. Liftmaster 6 had to shut down because of a fuel leak in the No. 1 engine. In order to maintain the flight schedule, Liftmaster 4 and 5 took off as planned. The fuel leak was quickly repaired and Liftmaster 6 and 7 joined up with the other two Chinooks en route to Homestead.

The following day we met with the C-130 pilots who would be escorting us to Puerto Rico. The C-130 was from the 55th Squadron, 39th Air Wing, based at Eglin AFB, FL. With all briefings completed, the only thing that would hold the flight back would be the weather. We kept a constant surveillance on the weather and it didn't look too promising for the next day. The crews stood by.

On the third day, we reported to operations at 0500 for final weather check. Air Force weather radar as well as a satellite picture indicated a massive front of thunderstorms in the flight path. With fuel consumption being a critical factor, the flight could only accept a short diversion and still have enough fuel to make Puerto Rico. The escort C-130 flew ahead and made a weather check. The flight was scrubbed for that day. After waiting for two days, the morning of the 25th still did not look promising. The C-130 made another weather check and reported the same conditions as before. Once again we waited.

Finally, on the 26th, en route weather was adequate for the flight. We took off at 0705 local. Two of the Chinooks had to pull maximum allowable power for takeoff. The other two had little to spare. After a few minutes into the flight, the C-130 reported that course deviation could be expected just before reaching Andros Island. Fortunately, it was only a 7-mile diversion which was within the fuel limitation.

The weather at Andros Island was clear and the view magnificent. The route of flight was such that land was never out of sight all the way from Andros to Grand Turk Island.

Auxiliary fuel system, consisting of four 600-gallon tanks, was installed in the cargo bay

Estimate to San Juan was 7 hours and 32 minutes. I offered a six-pack to the crew whose estimated time en route was the closest to the actual arrival. Individual crews made known their individual estimates and waited for the outcome.

As covered in the briefing before departure from Homestead, the decision to continue would be made at Grand Turk Island. Grand Turk was selected because it was the last place where fuel could be obtained. The flight arrived at the decision point, and based on the fuel consumption checks that had been made, all four crews reported that each had more than adequate fuel remaining. When I announced, "Next stop, San Juan," I'm surprised the people in San Juan didn't hear the cheers from the Liftmaster crews.

The remainder of the flight was uneventful. Liftmaster arrived in San Juan after 07+33 hours of flight. (The beer went to Liftmaster 4, who was only 1 minute off on the estimate.)

At 0900 on 30 September, we departed Puerto Rico en route back to Homestead AFB. After 6 hours and 15 minutes of flight (with a strong tailwind), the flight arrived in Florida.

The flight departed Homestead at 1030 on 1 October to Ft. Rucker, AL. There we were greeted by Major General William J. Maddox, Commander of Fort Rucker and Commandant of the Army Aviation School, and a reception was given in our honor at base operations.

On the morning of 2 October the crews gave their aircraft a final going-over prior to departing for Ft. Campbell. The history-making trip had been exciting, but we were ready to go home. We departed Ft. Rucker at 1030 and landed at Campbell at 1400.

Major General Sidney B. Berry, the division commander of the 101st, welcomed us back from our historic flight. In a speech the general delivered, he said, "It will take a considerable period of time for the full significance of this flight and this operation to register upon the United States Army, the proponents of airmobile warfare and those who design aircraft."

Phase III of Operation Longhaul has been successfully completed. Phase IV (planning) is underway and Phase V, flight to Europe, is just around the corner. When Phase V of Operation Longhaul is completed, there should be no doubt that self-deployment of the CH-47 can be safely accomplished.

At left, crewmember prepares the "San Juan Express" for the flight to Puerto Rico. Below, Liftmaster crew practices in-water landing before Operation Longhaul

If you have a question about personal equipment or rescue/survival gear, write PEARL USAAAVS, Ft. Rucker, AL 36360

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

Service Life of OV-1 Seat Belt and Harness Assembly

On 28 November 1973, the following message was issued by the U. S. Army Aviation Systems Command for dissemination on the service life of the OV-1 seat belt and harness assembly, Part No. 134F10246-11, FSN 1680-432-2528.

". . . subject item . . . is in a critical stock position with delivery expected in March 1974.

"Analysis of previous strength tests of seat belts and harnesses shows that the life of subject item can be extended from 5 to 5½ years on a one-time basis provided that an increased inspection is implemented. Accordingly, the life of subject item only is hereby extended from the 5 years in paragraph 54a of TM 55-1680-255-24 to 5½ years on a one-time basis.

DA Form 2408-18 is to be amended to reflect this extension using this message as authority. When subject items are available in stock, this extension is retracted so as to save the time of the increased inspection.

"Every subject item between 5 and 5½ years old shall be given an initial inspection and an inspection every 30 days thereafter, which include the present inspections in paragraph 35c and 38c of TM 55-1680-255-24 with the following additional inspections:

"Inspect for cuts or burns on the surface of the webbing.

"Inspect for wear of the webbing in the area of the adjustable fittings as evidenced by frizzing of surface of webbing (compacting of webbing is not wear).

"Inspect for extreme discoloration of webbing from sunlight or stains from grease and other contaminants.

"Inspect for broken stitches.

"The following criteria shall be used to replace the subject item: Any loose or broken stitches, any cuts or burns, any improper operation or corrosion of hardware, any wear of the webbing, any stain that is visible on both sides of webbing, any sunlight discoloration which causes center of belt to be a much different shade than the sides or any other signs of damage which may render it incapable to performing its restraining function."

Marking Procedures for SPH-4 Helmets

Reference Section VI, TM 10-8415-206-13. This unit desires to paint and/or mark its SPH-4 helmets in accordance with the appropriate regulations. Request advice as to best markings for the helmet.—Detachment commander

The marking of SPH-4 helmets can be authorized by major commanders within their command. The marking procedures are outlined in paragraph 3-21, TM 10-8415-206-13, dated 13 April 1972, and Change 1, dated 22 March 1973. Orange tape (P/N 3483), manufactured by Reflective Products Division, Minnesota Mining and Manufacturing Company, St. Paul, MN 55101, for this purpose, will have to be procured locally.

Currently, marking procedures outlined in the TM are under review by the U.S. Army Aeromedical Research Laboratory and the U.S. Army Agency for Aviation Safety to determine need for reflectivity during night operations. If the review warrants, changes to the TM will be submitted.

Fire Protective Clothing

Fire, more than any other hazard associated with flying, has always been a terrifying prospect for aviators. Although great advances have been made in the development of protective clothing for aircrews, and crashworthy fuel systems have lessened the probability of postaccident fires, there is one item of clothing currently in use that is miserably shy of being called protective—the flight jacket. It melts when exposed to flame, and absorbs rain on a par with a good quality sponge.

The Army has always stressed the necessity of wearing fire protective clothing, and the inadvisability of wearing any nylon-type materials which can melt, stick to exposed skin and horribly disfigure the victim of a fire. When can we expect the Army to provide a new flight jacket for the field?

I believe that a leather flight jacket, similar to the tried-and-proven Navy/Marine Corps type, would be a far superior product. The German Air Force has a similar leather jacket, in a light gray color. I'm sure the color could be produced in an acceptable Army shade.

It appears to me that the adoption by the U. S. Army of a leather flight jacket similar to the U. S. Navy or German Air Force types (R&D already completed) would offer increased fire protection for our pilots and crewmembers.—Aviator

The U. S. Army has tested and adopted a flight jacket made of Nomex material. It is similar to the nylon jacket with knitted cuffs and waistband. The adopted jacket is water-repellent, machine washable and made of 4.2-ounce Nomex I material. The new Nomex flight jacket is designed to provide aircraft cockpit comfort in a +40 degree F. environment. The new jacket is currently undergoing the manufacturing phase of production. This phase should be completed in the near future and delivery to the aviation field units should be accomplished in one year.

Nomex was selected over leather because it provides greater thermal protection than leather, is easier to clean and maintain and is less expensive to procure. Additional information on the new Nomex jacket may be acquired by contacting Mr. T. L. Bailey, Chief, Clothing and Equipment, U. S. Army Natick Laboratories, Natick, MA 01760.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Cruise—Don't Abuse: A "cruise" clearance is an air traffic control clearance issued by air traffic controllers to pilots in order to reduce communications, workload, conserve fuel and afford the pilot with flexibility in his operation. Because questions have arisen as to controller application and pilot action/responsibility while operating on such clearances, the procedure has been rewritten. The amended procedure authorizes the pilot to climb and descend in a block of airspace but prohibits climb when the pilot starts descent and reports leaving an altitude in the block. It also provides the means for the pilot to use the provisions of the Federal Aviation Regulations when proceeding to an airport that is within/below/outside controlled airspace with or without a prescribed/approved instrument approach procedure while retaining search and rescue protection. If you've cruised through this, slow down and turn your volume up.

The word cruise when used in an ATC clearance authorizes a pilot to conduct flight at any altitude from the MEA/MOCA up to and including the altitude specified in the clearance. The pilot may level off at any intermediary altitude within this block of airspace. Climb/descent within the block is to be made at the discretion of the pilot. Once the pilot starts descent and reports leaving an altitude in the block, he may not return to that altitude without additional ATC clearance. Further, it is approval for a pilot to proceed to and make an approach at destination airport and can be used in conjunction with (1) an airport clearance limit at locations with an approved/prescribed instrument approach procedure provided the instrument letdown is conducted in accordance with FAR requirements for that airport, or (2) an airport clearance limit at locations that are within/below/outside controlled airspace and without an approved/prescribed instrument approach procedure. Such a clearance is NOT AUTHORIZATION for the pilot to descend under IFR conditions below applicable MEA/MOCA, nor does it imply that ATC is exercising control over aircraft in uncontrolled airspace. It does provide a means for the aircraft to proceed to destination airport, descend and land in accordance with applicable regulations governing flight operations. This also assures flight following service until such time as the flight plan is closed.

Attention All Army Aviators: We all know that an experienced ground controlled approach (GCA) controller can put you right over the runway numerals, provided he's had the practice and provided you've had the practice. During these days of fuel shortages and fewer flying hours, it is mandatory that maximum benefit be obtained from each flight. To help our GCA controllers maintain a sharp edge on their proficiency, and you on yours, why not give GCA a call on the way in from your next flight? If you are out boring holes to maintain flight proficiency, request a few practice approaches. Constant use of the GCA facility keeps your operators proficient, helps their morale, spotlights equipment deficiencies and builds a strong foundation for a sound controller-pilot relationship. Commanders can help this happen by constantly emphasizing the importance of controller/pilot GCA proficiency. If your airfield has no GCA facility, all the more reason to maintain your proficiency by using the GCA the next time you go into a neighboring AAF. That GCA is yours, also!

Get to know the capabilities of your GCA facility and use it. Don't save it for a rainy day.

☆ U.S. Government Printing Office 1973—746-161/5

Soldiers Helping Soldiers.....

WHEN TORNADOES struck the residential areas of Ft. Rucker, AL, on two successive days, 29 and 30 December, scores of enlisted men of the U. S. Army Aviation Center spontaneously appeared on the scene to help the stricken families.

The twisters demolished 14 sets of family quarters and another 10 received major damage; some 100 buildings were damaged by the violent tornadic winds.

Holiday leaves and advance warning helped to keep the injuries to 29. Miraculously there were no fatalities.

Offers of help in the manner of food, clothing, furniture, appliances and whatever might be needed came from post residents and others in adjacent communities. Numerous Ft. Rucker families living outside the affected area volunteered to sponsor those made homeless.

The efforts of the Aviation Center's Soldiers and Post Engineers, Military Police and the Army Community Services were praised for their immediate response to the victims' needs. The disaster surfaced the togetherness that exists among Army personnel... a unity that can't be beaten—Soldiers helping Soldiers!

SEE PAGE 41 . . .

operation longhaul

"It will take a considerable period of time for the full significance of this flight and this operation to register upon the United States Army, the proponents of airmobile warfare and those who design aircraft."

Major General Sidney B. Berry
Commander
101st Airborne Division